

School
Health
Education

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and

Public
Health

School Health Education And Public Health

[A Text-book for B. Ed., L. T., B. A.
(Education) & B. Sc. (Home Sc.) Classes]

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PREFACE

This book is primarily intended to serve the needs of the students of B. Ed., L. T., B. A. (Education) and B. Sc. (Home Sc.) classes. In the organisation of the subject-matter the authors have kept in view the conditions prevailing in our own country. Hence the illustrations and instances herein have been incorporated as relevant to our schools and country in general. However, care has been taken to see that this feature of the book does not mar its universal character.

In our land there has been an increasing awareness of the precautions that should be taken for the protection of the health of the public in general as our happiness depends on the same. Hence our Central and State Governments are running a number of health schemes and medical services in different parts of the country. The health and prosperity of the people depend upon the size of the population. There has been a population explosion in our country as in many other parts of the world since the middle of the current century. Hence our Government, naturally, feels greatly concerned of this alarming situation and it has started a national programme of family planning and population education for controlling and facing the consequent problems. As a result, such items relating to public health as rural sanitation, population education, family planning and population explosion etc., are being incorporated for obvious reasons, in the courses of studies meant for students of B. Ed., L. T., B. A. (Education) and B. Sc. (Home Sc.) classes. Therefore, this small volume meant for these students has included within its purview a separate section entitled 'Public Health' which deals with items relating to public health and other allied ones.

It is hoped that this volume will meet the requirements of the students for whom it is primarily addressed. This book is also likely to be of general interest to all those who are in any way interested with the welfare of their children in particular and of people

in general. Any constructive suggestion for the improvement of the book will be gratefully received.

The authors are grateful to their publishers for the keenness and promptness they have shown in bringing out this volume in spite of their other very heavy commitments in the publication field.

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PART I

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Chapter One

Scope And Uses

For understanding the principles of health education for school life, it is very important to study the science of health because one cannot grasp the health rules without its help. In this chapter we shall study the scope and uses of health education pertaining to school life.

The study of the science of health is necessary for a man both in his capacity as an individual, and also as a member of the society. The first aspect of the study covers the physical and mental development. It includes the study of the entire physical activity, motion, respiration, eating and the functions of brain, such as thinking, feeling and activities directed towards the achievement of a certain objective. The study is carried on in close association with environment. The study of science of health is important socially as well. An individual's health and development is intimately related to his social surroundings. The society influences, considerably the development of an individual. Environmental study in its thoroughness is, therefore, the pre-requisite for the full knowledge of an individual's health.

Hygiene is an integral part of physiology which imparts knowledge to us about the functions of various limbs of the body in a healthy condition. Hygiene tells us the methods and rules for leading a healthy and disease-free life. To have a complete grasp of these rules and methods it is necessary to acquire a knowledge of physiology as well.

Hygiene has a wide scope. It embraces all those sciences which contribute to the long and healthy life of human beings. Ignorant people generally fall a prey to superstitions, and attribute

the causes of various diseases to divine displeasure, evil spirits and witchcraft etc. These, obviously, are false notions and can be removed only by proper study of the science of health.

School health education is a vital part of general hygiene. It includes all such instructions that enlighten a student about activities and functions contributing to preservation and promotion of health. By means of school-hygiene, the spread of disease in the school-going children can be checked and their eradication can also be attempted. Thus, an attempt is made to increase the life-span of students. A thorough knowledge of health rules underlines the needs of the study of anatomy and also the symptoms of common diseases of children. In this connection, practical knowledge of causes and diagnosis is equally essential. School hygiene includes the knowledge about the environment, equipments and routine of the school as well.

A question may be asked as to why is it necessary for the would-be teachers to know about school-hygiene? The answer is quite obvious. A teacher's primary duty is to look after and bring about the mental development of students which is possible only when there is a sound body guaranteeing a sound mind. Hence, a knowledge of school-hygiene for a teacher is very necessary. Only from a healthy seed comes out a healthy plant. So only a healthy child can ensure the growth of a healthy man. It shows how essential it is to give proper attention to health from the early childhood. School-life during which period, the teachers prepare a child for the future is thus quite important in the life of a man. Hence, it is necessary for the teacher to know about the science pertaining to health. It is now an important part of a school's programme. It is the teacher's duty to be aware of various health problems of the child and make constant efforts to draw the attention of students and guardians to these problems and also help them in effecting improvements wherever necessary. A teacher failing to perform this duty exposes his students to various hazards affecting health.

A large number of students in the school lack nutritive diet and also healthy living environment. Such students develop many physical defects. They generally have flat and contracted chests, thin and curved legs, flat foot, round shoulders and bent waists. Some times, there is no symmetry in the formation of shoulders. They are uneven. The unhealthy living surroundings also contribute

to these physical deformities and unhealthy appearances. They are susceptible to contagious diseases, which in their turn cause a lot of disturbance in their studies. Teachers, besides paying attention to the living environment and nutrition, should also take into consideration of the school's arrangements for light and air in the classrooms and proper seating-arrangement. All these have a cumulative effect upon the health of children. Instances are not lacking of schools situated in dark lanes with small and damp rooms and no proper seating arrangements and ventilation. There is no gain-saying that students shut up in such a school can never maintain good health. The environment affects a child not only physically but psychologically and morally as well. It demands unceasing effort on the part of teachers to provide them with a congenial atmosphere for study. If the teachers pay due attention to the diet, environment, school sanitation, dresses, health and mode of living of the students, they will certainly make positive contribution in giving the country citizens with sound health and character.

SUMMARY

The area of science of health is widespread and for mastering this subject it is necessary to have a knowledge of physiology, body movements and anatomy. School-hygiene should be studied with a personal and social angle.

The knowledge of school hygiene is very necessary for the teacher, because he is concerned with the mental development of the child and the relation between a healthy mind and a healthy body is too well-known to be emphasised. Home atmosphere, circumstances, food, condition of the educational institution, the design of its rooms etc., influence the health of children. Teachers should also pay attention to the ways of living, dresses and food habits of students.

EXERCISES

1. What is meant by science of health ? What other sciences have to be studied for getting a sound knowledge of this science ?
2. What ends should be in view while studying the science of health, and what should be its aim ?
3. Why is the knowledge of science of hygiene necessary for a teacher ?

Chapter Two

Factors Influencing The Growth of The Child

Differences in the Child's and Adult's Bodies.

The body of a child develops every day. Terman says that the differences in the bodies of a child and grown up exists in every nerve and vein. Difference is there even in the proportion of different limbs as also in the bones. A child has got softer bones than the grown up persons and the heart-beat is also quicker in his case. The child like a soft and undeveloped object is easily affected by external factors. This difference is not found only in the development of bodies of adults and children but is also found in the children of the same age-group. It is not necessary that physical development should be uniform in all children. There are certain factors that cause different things in the same child at different ages. The physical exercise which is useful at a certain age, may not be so at another age. So is the case with the diet, which doing good at one stage may prove unwholesome at the other. These things necessitate that the child should be given greater care than adults. Those who are responsible for promoting the development of children should be especially careful about all these things.

There are two factors that affect the development of a child. They are (1) heredity and (2) environment.

Heredity

Heredity is the sum total of all such things that a child inherits from his forefathers. It has its root not only in the mother and father of a child, but in the remote ancestors as well. The child who

is born after completing nine months in mother's womb, has got fairly an old history of his existence. There are certain such forces acting in him as existed in his early forefathers. These things which are quite new in the child appear to be so because of the reason that the primitive man is no more amongst us for giving us an opportunity to see for ourselves those very things present in him.

What are the things which a child gets from heredity? It is a difficult question. No definite answer has been given to it as yet. The only thing which can be said with certainty is that a child gets certain physical and racial qualities from his forefathers. If it were no so, the entire creation would have come to an end and there would not have been the possibility of human beings giving birth to human beings, horses to horses and elephants to elephants. A living creature inherits its form and feature from its parents. Eyes, hairs, body complexion, fingers in hand and foot, physical stature, childhood etc. are certainly such things that are inherited. Sex organs, muscles, skeletons blood-vessels are hereditary. In the physique and nature of a child, certain qualities of their forefathers are existant proving thereby that the forefathers have a great hand in shaping the child in its present form. Healthy and well-formed body and numerous ambitions are inherited properties of an individual and so are the diseased body and several other vices. Evidently, one cannot afford to neglect the influence of heredity in the development of a child.

Environment

We have stated above that a child inherits from its forefathers a number of qualities and forces. After birth, these qualities and force of a child are influenced by the environment as well. The environment determines to a great extent the direction of development and also plays a significant role in slowing down or speeding up the process of development. In two different environments, children from the same parents develop distinctly two different personalities. A child getting good training and upbringing from parents and respect in the society ultimately, becomes a responsible and respectable citizen and attains a stature in which the entire nation may feel a pride. Just reverse is the case of the child denied all love in the family, and uneducated and hated by the society. He is seized of antisocial feelings. It can, therefore, be concluded that favourable or unfavourable environments affect accordingly the development of a child.

Environment includes all those things that influence the child both prior to and even after birth. These may be divided in three groups, namely : (1) pre-natal. (2) intra-natal and (3) post-natal.

A. Pre-natal.

(1) **Care of the Mother.** If during pregnancy, the mother does not get nourishing food and fresh air and has to live in unhealthy environment, the child's health will also be affected. In the same way, alcoholic drinks taken by the expectant mother, affect the health of a baby in the womb because these get mixed in the mother's blood and consequently tell upon the health of the baby. In the absence of nourishing food the baby gets the required material from the bones and particularly from the teeth of the mother. Thus, in the absence of proper nutritious diet, the mother would naturally become weak and the baby, too, would turn weak. His bones will not be strong. Injury to a pregnant woman can result in the death of her unborn child ; can cause abortion or result in some kind of deformity in the child. This in turn will retard his mental development. Thus, it should be seen that while the child remains in the mother's womb, the blood of the mother, food, air and her way of living create an environment which has a healthy influence on the development of the baby.

(2) **Hereditary Diseases.** Hereditary diseases, too, have their ill effects on the development of a child. Diseased and unhealthy parents beget diseased and unhealthy children. Children of parents suffering from venereal diseases, like gonorrhea and syphilis, are constitutionally weak and easily fall victims to various diseases.

(3) Drugs like quinine and iodine have detrimental effects on the unborn child. There is always a possibility of abortion, deformity or even death of the baby in the womb, if the mother uses these medicines during her pregnancy.

(4) Mother's age is another factor that counts in the development of the baby. A very young mother's child is generally weak and complications, too, arise during delivery. On the other hand, the babies of very aged women, too, are likely to be unhealthy. But a healthy woman of mature age gives birth to a healthy and strong baby.

B. Intra-natal Birth.

There are chances that the baby might get injured or contract infectious diseases at the time of birth. Sometimes, head injury cau-

ses deformity of brain causing bleeding of brain nerves. This results in derangement of mind and deformity of body. Infection, too, has its bad effects. It is, therefore, very important that due attention is paid to the child during birth and every possible precaution is taken to ensure that no injury is caused to the new-born child.

C. Post-natal

As in the case of pre-natal period when nutritious diet taken by the mother affects the development of the baby, in the same way during post-natal period, nutritious food is essential for the mother to ensure healthy growth of the child. In the absense of good and balanced diet the mental and physical development of the child is retarded. Proper nutrition helps the physical development. When the child gets good and balanced diet all-round physical development takes place and the child gains power, height, weight and proportion. The body has power to resist diseases. Because of this power of resistance that proper mental development takes place. Lovely complexion, smooth and glossy hair, bright eyes, shining teeth, sound sleep, good appetite and upright body indicate the health of a child who has been brought upon nutritious diet. Contray to this, those who do not get proper and balanced diet can niether enjoy sound nor possess good appetite. Their body is also not properly developed and the mental growth, too, is retarded.

Sunshine and fresh air play as important a part in the healthy development of a child as nutritious food. Children born in slums and other unhealthy surroundings do not attain proper physical and mental standards. They fall victims to various diseases and neither get a sound sleep nor good appetite. Fresh air, sunshine and clean surroundings are essential for the proper development of a child. Those houses where sunshine does not reach become damp and children living in them suffer from diseases of throat, cough and respiratory organs. In these places, germs of malaria and yellow fever easily bread. Children living in such places cannot but fall victims to diseases.

SUMMARY

The body-builds of an adults and child differ. Even there is a differences between the build of two boys of the same age-group. Development is conditioned by heredity and environment. Physical and other qualities are the gifts of heredity. Environment may be divided in the categories : (1) Pre-natal, (2) Intra-natal and (3) Post-natal.

During pre-natal period, the baby is influenced by the diet of the mother, her care, hereditary diseases, the effect of drugs like quinine and iodine and the mother's age. During intra-natal period, the effect of injury or infection ; and in the post-natal period nutritious diet, fresh air and healthy surroundings count.

EXERCISES

1. "The physical and other characteristics of the child are hereditary gifts." Comment.
2. Write an essay on the factors that influence the development of the child.

Chapter Three

Human Body : Muscular System

General Structure of the Human Body

The human body is made up of very small cells. These cells can be seen through microscopes. The cells play an important part in the making up of the human body. A small particle of the semi-liquid substance called protoplasm is known as cell. Protoplasm is formed when oxygen, hydrogen, nitrogen, carbon and sulphur combine. The inner portion of the cell is called the core or kernel. This thing is like a globe or an egg in shape and controls the working of the cell. Different kinds of cells do different kinds of work. Their shape differs according to their work. Many of the same variety of cells are known as tissue. There are many varieties of tissues like fat tissues, bone tissues and muscular tissues. The fat tissues are made up of fat cells, bone tissues of bone cells and muscular tissues are made from muscular cells. In a nut-shell, the different kinds of tissues are made of different cells. The tissues build up the various parts of the body. Every part of the body has a different function to perform.

The human body is like a well-organised, well-administered and well-planned city where nature has kept in view everything and has made the best possible arrangements. The circulation of blood feeds the body, the discharge from bowels and sweat keep the body clean. The respiratory system is meant to fill in fresh air and expel the foul one. Arrangement for keeping contact with the outside world has been made possible through the nervous system. Bones and skeletons are to keep the body straight and muscular system for joining the bones and making them move according to need. For execution of different work there are various groups known as systems. The systems are of nine kinds as mentioned below :

(1) Muscular System.

This system provides power of movement to various parts of the human body. Muscles are connected with bones or strong tissue-d nets. The tissue-d nets are known as joints or nerves.

(2) Skeletal or Bony System.

The skeleton keeps the body straightened and upright, but not stiff or unbending like the wall of a house. The skeleton has been so devised that it can take turn or bend at many places. Bones are joined with each other. The joining substance is known as connective tissue. The skeletal or bony system is the main base of the body.

(3) Respiratory System.

The main function of this system is to provide oxygen to the cells, expel out carbon di-oxide and bad water from the body. Lungs and respiratory tubes form a part of this system.

(4) Circulatory System.

The various organs in this system take the food inside. Food is the most essential thing for sustaining life. These organs digest the food. Stomach intestines, liver etc., are the main organs under this system. These organs carry the useless and waste products to the other organs that throw them out. Throwing the waste out is the main function of the larger intestine.

(5) Excretory System.

Under this system come the lungs, the larger intestine kidney and the skin. The function of these organs is to throw out stool, sweat and urine etc., from the body. Much foul matter reach the blood. When the blood reaches kidney all this foul matter is discharged out through urinary passage. In the same way, sweat and stool are discharged out of body.

(6) Digestive System.

The main organs which come under this system are saliva-producing glands, the mouth, alimentary canal, stomach, intestines, liver and spleen. With the help of these organs we carry the food in the stomach and digest it.

(7) Nervous System.

The nervous system of the body controls and directs all the other systems. The brain, spinal chord and the entire network of

nerves constitute the nervous system. Their function is to control the activities of the entire human body.

(8) Reproductive System.

This system of the human body relates to the activities concerning the genital organs and the birth of children. In this are included the visible and hidden genital organs of male and female. When discharged matters of these organs of male and female unite another human being is produced. The race thus continues to exist.

(9) Lymphatic System.

Under this system come the lymphatic capillaries and glands through which the tissues receive their diet and foul matter is thrown out.

Musculatory System

The entire human body is covered with skin. If skin is peeled off red flesh will become visible. If we make a picture of human body without skin, it will be revealed that flesh is not in a uniform position on the body. At some places it is in larger quantities, while at other it is in smaller quantity. Besides, it is peculiar in make. Its both ends are thin and contracted, while the middle portion is broad and swelled. These pieces of flesh are called muscles. They exist both on the outer and the inner parts of the body. By outer part is meant the head, hands, legs and chest. In these parts muscles embrace the bones. Besides, there are some muscles which being in the inner part of the body do not remain joined with bones. Such muscles are found in the blood vessels, heart, stomach, intestines, etc. There are about 500 muscles in a human body.

Categories of Muscles.

Muscles are divided into two categories : (1) voluntary and (2) involuntary. Voluntary muscles are those which function according to a man's wish and are under his control. But there are certain muscles which do not function according to our dictates. These are known as involuntary muscles. Heart, stomach, muscles of the urinary tract and intestines come under the category of involuntary muscles. These continuously contract and expand. The action of heart cannot be controlled according to human desire. Similarly, function of the intestines are also beyond man's control. The food continuously goes down from the intestines. The retina of

the eye contracts in light and expands in darkness. This, too, cannot be controlled by man's desire.

Construction of Muscles.

The size and shape of the muscles varies from one another. Some are big, other are small, some are long and some are round. Leg muscles are big, while those of the eyes are very small. Their shape and size are governed by their functions. Voluntary muscles, too, are of different sizes. Leg and hand muscles are thicker in the middle as compared to ends. There are tendons on their ends through which they are joined with bones. Some muscles are joined with the upper membrane of the bone. Muscle's one end is joined with one bone and the other end with another bone and it remains in the upper position. The upper end is known as source or origin while the lower end is known as the entrance. The main part of the muscle is known as stomach which has contractible cells in it.

Functional System of Muscles.

The main function of these muscles is expansion and relaxation. When the muscle contracts, bone on both ends come nearer. The length of the muscle at this time is reduced but its breadth increases.

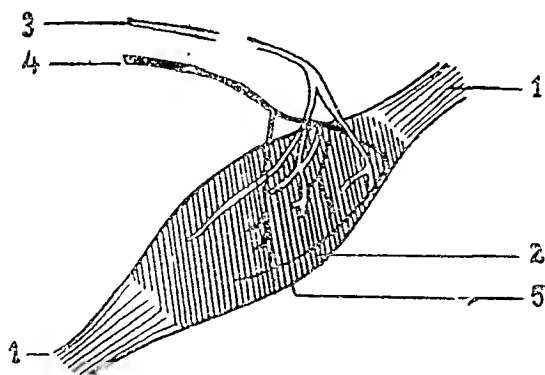


Fig. No. 1 Voluntary Muscle

- | | | |
|------------|-------------|------------|
| (1) Tendon | (2) Stomach | (3) Artery |
| (4) Vein | (5) Nerve | |

This action becomes quite clear when the action of the bicep muscle is examined in the upper arm. This muscle is joined near the joint of shoulder with the shoulder blade.

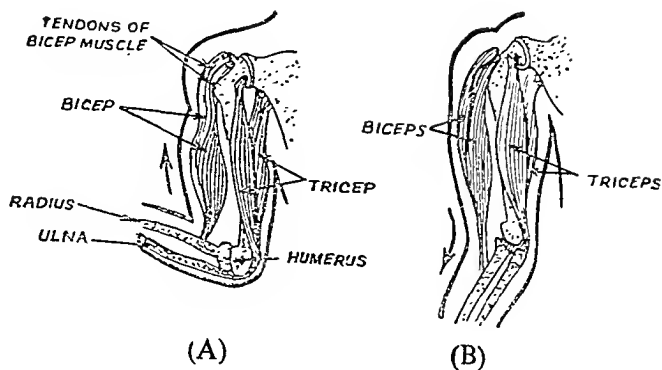


Fig. No. 2 Action of Bicep and Tricep muscles

(A) Contraction of Bicep

(B) Contraction of Tricep

Its belly is just in front of the hand bone, but it is not joined with it. When it contracts it turns small, thick and round and the forearm comes near the upper arm. One can understand this action by feeling the upper arm. When the tricep behind the hand contracts, the forearm straightens up. In the same manner, the expansion and relaxation of the muscles take place in various parts of the body. The movement of the different parts of the body rests on the contraction and relaxation of these muscles. The expansion and relaxation of muscles is made possible through the help of bones. In order to bring the forearm nearer to the upper arm, its outer bone is joined with elbow and only then the bicep contracts and raises the forearm. In the same way, for extending the forearm, the tricep behind the hand takes help. This muscle joins the elbow resulting in the extending of the forearm.

A number of muscles combine and make efforts to cause an action. An action is not caused by a single muscle. For example, in keeping the body erect, both the muscles in the front and on the rear act. The front muscles try to force the body forward while the muscles on the back try to keep the body in a backward position. As a result of this action and reaction the body remains in an upright position. The same action by many muscles causes movement of body in various manners.

It would be worth while noting here that muscles expand and

relax on receiving orders from the nervous system. That is why a serious head injury shock to nervous system turns the man senseless. It is so because during an injury or a shock, the instructions from mind are not passed on to muscles by the nervous system and the muscles remain loose.

Ingredients for the Formation of Muscles.

Muscles are formed with the help of many things. Three-fourth part of muscles comprises of water and the rest of protein and natural salts. Milk, almond, gram, meat, eggs are the main protein which provide food and strengthen the muscles. These things provide energy to the muscles as a result of which they function properly. Heat is generated in the body by taking these things. When the muscles do not work, a starchy substance is deposited in a large quantity. During action this substance is used by muscles. When muscles have to work more the quantity of this substance is reduced. Muscles remain healthy only when they work and get reasonable rest.

Development of Muscles.

Strength and development of muscles depend upon nourishing diet and physical exercise. In the absence of these two, the muscles do not get sufficient diet and consequently turn weak. Lack of fresh air tells adversely on the muscles. For keeping them strong and healthy, proper rest should be given to them. Rest gives opportunity to throw out foul matter from within and new energy is generated in the muscles. Useless and foul matter creates fatigue and laziness in the body.

Utility of Muscles.

Body is stimulated to action due to muscles. Had there been no muscles in the body, it would not have been possible to eat, drink, see, speak, laugh, sing, walk and write etc. The muscles keep the body in the desired position and help those parts where there is absence or shortage of bones.

SUMMARY

General Structure of the Human Body.

Small cells are the main constituents of the human body. These protoplasts are made up of oxygen, hydrogen, nitrogen sulphur and carbon. Groups of cells are known as tissues. They are of different kinds and form the various parts of the body.

The human body is like a well-planned, well-administered and well-organised town. There are nine systems which perform all the functions of the body. These are as under :

1. Muscular system, 2. Bony system, 3. Respiratory system, 4. Blood circulatory system, 5. Excretory system, 6. Digestive system, 7. Nervous system, 8. Reproductive system and 9. Lymphatic system.

Musculatory System

Muscles are of two kinds : (1) Voluntary and (2) Involuntary. Their shape and size differ. They are long, short, round and broad. They are further divided in three parts : (1) Source or origin, (2) Stomach and (3) Entrance place. Contraction and relaxation are their main functions. Movement in the body is caused by their contraction or relaxation. They keep the body in different positions. Water, protein and natural salts are necessary for them. Their health and strength depend on fresh air, protein, rich food, exercise and adequate rest. During rest they throw out foul matter out of the body. The discharge of foul matter gives new strength to the muscles.

EXERCISES

1. "The human body is like a well-planned and well-organised town." Comment.
2. Give a brief account of the various systems in the human body.
3. What are the categories of muscles ? Explain them in detail.
4. What things are necessary for the formation of muscles ? How do they become healthy and strong ?
5. What is the utility of muscles ? Explain.

Chapter Four

The Skeletal System

There are a number of bones in the human body. If skin and flesh are removed from the body, bones would remain. This skeleton is an awe-inspiring object to look at. But this skeleton is the rock foundation of the human body. This bony structure is also called the skeletal system. This bone structure is commonly known as skéleton.

Specialities of Skeleton.

The skeleton is not rigid or immobile like a house. The most important feature of the skeleton is that it can bend or take turn at many places according to a man's desire. Muscles in the body help its movement. Its flexibility helps the acrobats in a circus to perform various bodies tricks and people witnessing their performance become inclined to think that the body is boneless.

Number of Bones

The total number of bones in a human body is 206 which are as follows :

- (1) Eight bones in the upper part of skull and 14 on the face totalling in all 22.
- (2) Twenty-five bones in the chest.
- (3) Sixty-four bones in the upper part. Each hand has 32 bones.
- (4) In the lower portion, there are 62 bones. Each leg has 31 such bones.
- (5) Twenty-six bones are found in the rear.

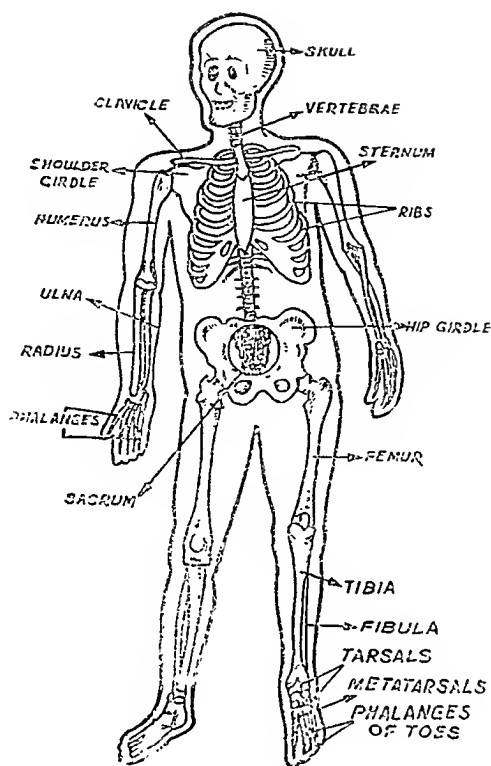


Fig. No. 3 Skeletal System

Besides, there is a bone between the larynx and the chin and six bones in the both the ears. In this way, the bones total 206. 'What is the utility of so many bones' ? is a question that naturally arises. The answer to this question is evident. These bones also help in the movement of the body. Every part of the human body is made of a number of bones and not by a single bone. This two has its utility. Had there been only one bone in a particular part of the body it would have become entirely useless, had that single bone been broken in on account of injury. But because of the presence of a number of bones in a particular part of the body an injury caused to some bone does not invalidate that part entirely. Of course, there is a considerable pain when a bone is broken but in course of time, with proper treatment, it becomes allright. Moreover,

the presence of so many bones make the skeleton considerably strong as compared to a single bone skeleton.

Shape, Size and Structure of Bones

Bones are tubular and therefore light and strong. The cavity in them is filled with a substance known as marrow. According to the shape and size, these could be divided in the following categories :

- (1) Flat bones : Bones of the skull are flat.
- (2) Short bones : Bones of the fingers and toes are short.
- (3) Long bones : Bones of the hands and legs are long.
- (4) Cubical bones : Bones of the knee and wrists are cubical.
- (5) Irregular bones ; Bones of the spinal chord are irregular, and
- (6) Cuneiform bones : These bones are pointed at one end and gradually turn thick, as in the ankle.

The unique thing about the bones is their hardness. The body remains hard and strong as a result of this quality of the bones. Calcium and some salts cause this hardness in the bones. Calcium phosphate, carbonate flouride and magnesium phosphate are important in this respect. Calcium phosphate is found in abundance in the bones.

Various Parts of Skeleton

Skeletal system may be divided into three categories :

1. Skull, 2. Trunk and 3. Upper and lower extremities.

The skull is further subdivided into two parts : 1. cranium and 2. face. The first part consists of eight bones. It is like a strong box. Brain remains safe in it. The eight bones that constitute this cranium are as follows :

1. Frontal bone which forms the forehead.
2. Skull-roof and the two side partial bones.
3. There is a bone in the back of the skull. This is known as occipital bone.
4. Two bones in both the temples are known as temporal bone. Besides the above six bones, there are two more bones. One is known as spheroid bone and the other known as ethmoid bone.

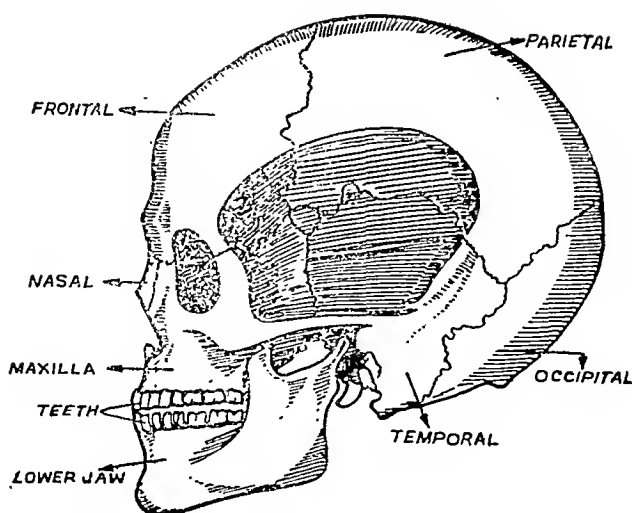


Fig. No. 4 Skull

These eight bones of the skull are joined with each other by a fixed and well-organised joint. There are a number of holes in the skull tube. The biggest hole in the tube is in the rear portion towards the back where spinal chord joins the brain. Some veins of the nerves come out from other holes and blood vessels come and go.

In the case of children, the above-mentioned eight bones are not joined with each other. There are two fontinalis in their skull. One is known as anterior and the other as posterior fontinalis. These remove the danger of the skull cracking during birth and provided it with strength to stand the impact. These fontinalis join each other at the age of two. One should be very careful to protect the child against head injury during the first two years.

The face consists of 14 bones which are listed as below :

(a) Superior maxillary or upper jaw bone, (b) Inferior maxillary, (c) Two molar or cheek bones, (d) Two palate bones, (e) Two nasal bones, (f) Two spongy bones, (g) Two rachrymal bones, (h) One vomer bone.

Out of these bones, the inferior maxillary is movable. This can move upwards, downwards, sideways, inside and outside. Chewing the food is possible only with the help of this bone. On the face open

up the cavities that protect our sense of hearing (ear), of smelling and breathing (nose) and of seeing (eyes). These cavities protect these important organs from outside injuries. The middle portion of inferior maxillary is known as chin. On its upper portion are 16 cavities for teeth.

Trunk

The trunk consists of vertebral column, ribs, sternum, shoulder girdle and the hip bones.

Vertebral Column

Spinal chord is the base of the human body. This is known as vertebral column. This begins from the neck and goes down nearly two or three inches above the anus. This column consists of 26 different parts which are interconnected. Each of these parts is called the vertebrae of the spinal chord. These structures are unique. These bulge out and feel rough when touched.

In the spinal chord of children there are 33 irregular bones. Five of the last nine bones out of these 33 join and turn into a single bone. Likewise, the remaining four combine to form another bone. It is because of this phenomenon that there are only 26 bones in the spinal chord which have been grouped as under :

- (a) Seven cervical vertebral form the neck.
- (b) Twelve dorsal thoracic vertebral form the back.
- (c) Five lumbar vertebral form the waist region.

(d) Out of nine pelvic vertebral which form the pelvis region, the first five are called sacrum, while the remaining four are separate and can turn this way or that. The two vertebrae of the lower part are interconnected and are fixed.

Except the first two and the last nine vertebrae, others are almost similar in shape. The beginning part of vertebrae is like a stone-studded ring. Just like in a stone-studded ring the stone-fixed part is thick and broad and the remaining portion is thin. The front part is known as the disc, while the circular one is called the neural arch. Many portions of the two parts are projecting. On both the sides of neural arch are projecting parts known as transverse process. In the back portion of the neural arch there is a projection. This projection is pointed. These pointed projections are interjoined with the result that vertebrae are strongly interlinked. Muscles also stick to these projections and with their help the back can easily bend.

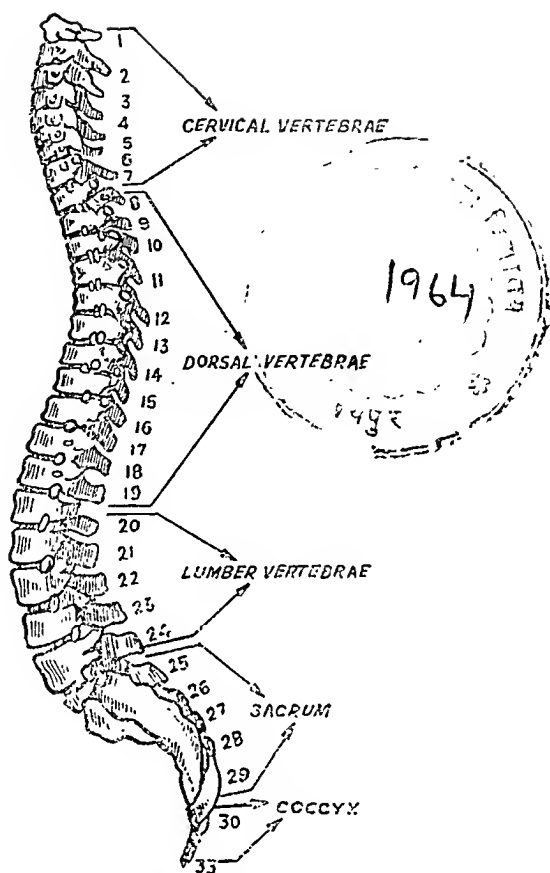


Fig. No. 5 Vertebral Column

The discs of the vertebrae are placed on each other, and thus they sit tightly on one another forming a tube. This is called the vertebral canal. Through this canal passes the spinal chord which resembles in shape to a thick rope. The veins coming out of medulla oblongata-throughout vertebrae spread throughout the body. These nerves help us to know and feel different objects and they also control the function of the various parts of the body. Between the two vertebrae in the pad of cartilage. The pad of cartilage saves the bones from friction and there is no fear of a bone striking against the other during a fall or a jump.

The vertebrae of the various parts vary according to need. The lower vertebrae are comparatively larger and heavier than the upper

ones. The neck vertebrae are the lightest, while waist region ones are the heaviest. It is but natural because the body weight is heavier at the waist as compared with that at the neck.

Besides the above, there are other differences between the vertebrae. The projections near the vertebrae of neck bear holes. The pointed projection in the back portion of the vertebrae behind the chest are very long. All the projections in the waist region vertebrae are thick and strong.

The first and the second vertebrae of neck have some peculiarities in them. In the first vertebrae, there is an arch whose back pointed projection is very small. In its upper portion are two smooth projections. On them rest the back-bones of the skull. In the upper parts of neck's second vertebrae is teeth-like projection which fits in with the first vertebrae neural arch. The head moves in various directions with the help of these teeth-like marks.

The structure of the spinal chord is not like a straight rod. It has several curves. Some of its portion appears to bulge outside while others seem to bend inwards. The neck portions seem to be bending outwards. In the back side of the chest there is a long arch-like pit and waist region seems to bulge outwards.

These curves have their own advantages. The important ones are given below :

- (a) These curves add strength to the backbone while man carries head-loads.
- (b) Provide strength to the backbone when it expends or relaxes.
- (c) Help the extremities of the stomach and chest bones.
- (d) Provide room for the interrelation of back's powerful muscles.

Wrong sitting positions during student life sometimes result in certain deformities. The number of curves are either get reduced or increased owing to wrong sitting positions. The back, too, turns ugly and deformed and there remains a possibility of hunch appearing in the back.

Sternum

The chest, too, is a box like the skull. The heart and the lungs lie safe in this box. The chest bones are six to seven inches in length. The upper portion of the chest is broad and narrows downwards.

The chest is divided into three parts :

- (a) In the upper-portion collar bones join each other.
- (b) In the centre seven ribs on each side join.
- (c) The lower portion is made up of cartilages.

There are twelve ribs on each side of the chest. In the front, a bone in the middle of the ribs joins them. This broad bone is called the sternum. In this way, there are 25 bones in the chest. Seven pairs of bones are joined in the chest while three pairs join the seventh pair, but these three pairs of bones have no relation with the chest. The last two pairs of the ribs are small and do not reach the sternum. These are, therefore, called the floating ribs. Every two ribs are joined in the middle by muscles. These muscles are intercostal muscles. During respiration, the bony structure of the chest lifts itself upward and goes downwards due to expansion and relaxation of the muscles.

The respiratory and the food tubes come down through the upper part of the bony chest structure. At this very place, a number of blood vessels and nerves come down from the neck to the chest and vice versa. In the lower portion of this body structure lies an arch-like cover of muscles known as diaphragm. This separates the chest from the stomach. Through this passes the food tube from the chest to the stomach.

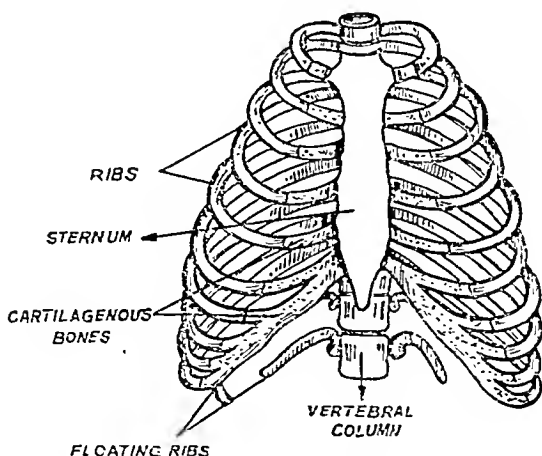


Fig. No. 6 Thorax

Upper Limbs

The structure of the upper extremities is joined to trunk thro-

ugh a circle of bones. This circle is called shoulder girdle. The shoulder girdle is formed by the collar-bones in the front and the shoulder blade in the rear. Like ribs, the collar-bone is joined to the sternum through cartilage. The shoulder-blade rests on the rib bones in loose and plain way. The bones of the shoulder girdle are thin and can easily turn in one or the other direction.

Each arm has the following parts :

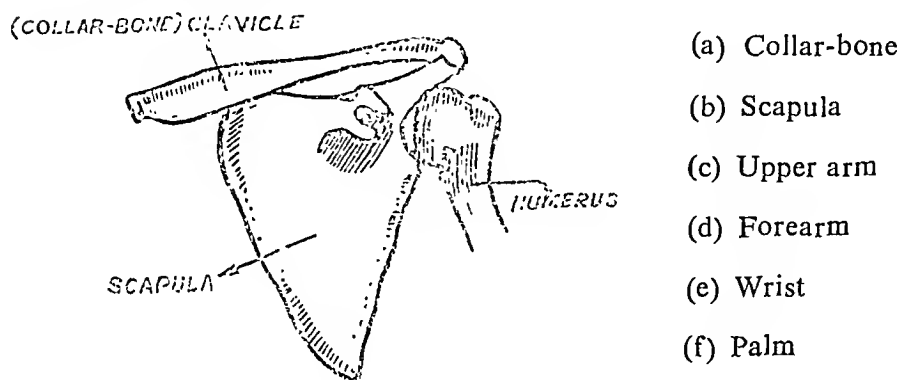


Fig. No. 7 Shoulder Girdle

The division of bones in them is as under :

Collar-bone is on the uppermost portion of the chest. It has only one bone. Scapula is a single bone ; one bone in the upper arm ; two bones in the forearm ; eight bones in the wrist; five in the palm ; 14 in the fingers. This brings the total of bones to 32 in the an arm and 64 in both the arms : (See Fig. No. 8)

Lower Extremities

Ordinarily, the structure of the lower extremities resembles that of upper extremities. Pelvic, thigh, leg and calf are included in the lower extremities. The division of bones under this category are as follows. The hip bone, the thigh bone, the calf bone, two leg bones, seven knee bones, five foot bones and fourteen bones of the toes. The total in this way comes to 31. Due to difference of one bone in wrist and knees, the structures of upper and lower extremities vary. The wrist has eight bones, while the knee has only seven.

Hip Girdle

The structure of lower extremities is joined with the trunk by the hip girdle. The hip has a broad and special type of bone. Hips are two in number. The two bones of the hip are joined with the back in the waist region by a triangular bone called sacrum. Below the two bones are the genital organs of the male and female.

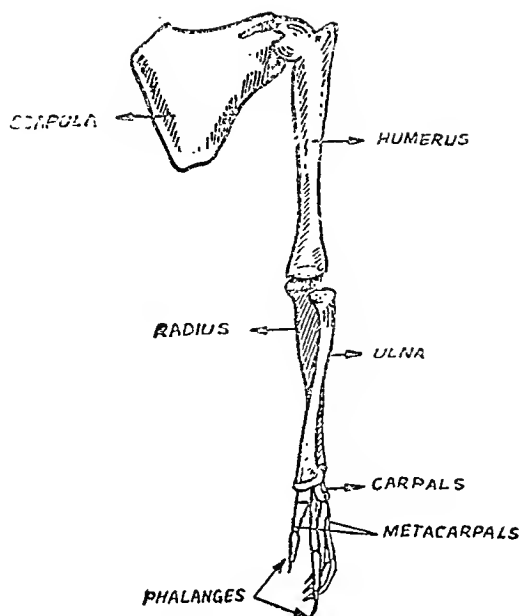


Fig. No. 8 The Bones of Upper Extremities

Despite the two bones being connected through sacrum, the backbone below the sacrum is not joined by the tail bone. In the pelvic girdle are the genital, reproductive and excretory organs of males and females.

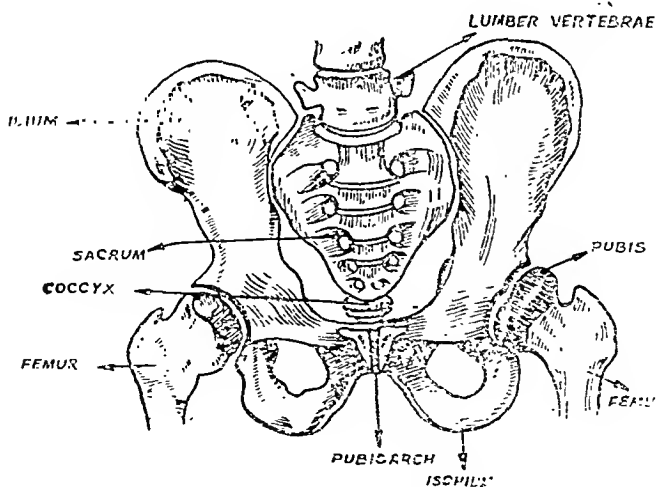


Fig. No. 9 Hip Girdle

In comparison to male's pelvic girdle the female's is less deep but broader. The shape of the pelvic girdle is like a bottomless pot.

The three parts of the hip girdle which are as follows are worth mentioning :

- (1) The broad upper part known as ilium.
- (2) The narrow lower part called ischium.
- (3) The broad front part named pelvis.

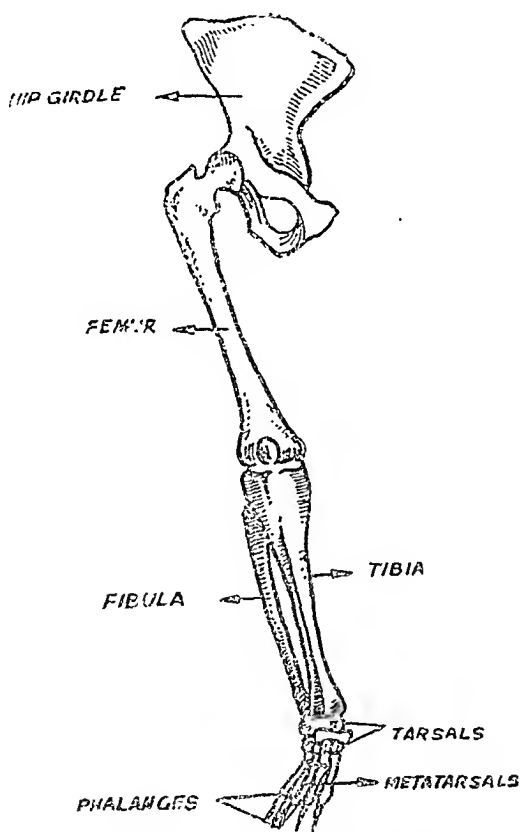


Fig. No. 10 The Bones of Lower Limb

During childhood, the above three parts are visible separately but in course of time they gradually join each other on the outer part of the hip girdle. The junction creates a round cavity which is called acetabulum. In both the hips, there is a round cavity in which fit in both the thigh bones properly.

Like the upper arm there is a bone in the thigh called fibula.

This is the longest and the strongest bone in the body. Its upper end is round like ball and fits properly in the hip bone. The lower portion of this bone is somewhat broad and is joined to the leg bone at the knee. It is a very strong joint. There is also a triangular bone on this place called tarsal bone. This bone can be shaken or moved.

Below the knee there are two bones in the leg like the arm. These are called metatarsal bone and joints. The metatarsal bone is narrow and comparatively weak. The upper part of the tarsal bone is comparatively thick and broad. It joins the fibula at the knee. The lower portion of the tarsal bone which is narrow in conjunction with acetabulum makes its inner projection.

There are seven acetabulum. These form the knee. One of these thick bones is joined with the tarsal bone. Another bone with a curve downwards forms the heel.

Like the palm, there are five bones in the feet. The toe bones are joined with them. The total number of the bones is 14. Two in the first toe and three each in the rest total 14.

Bone Joints

It is evident from the last chapter that the skeletal or bone structure has many joints at places. Those places where two bones or cartilages join each other are called joints. These joints are divided in two categories : (1) movable, and (2) immovable. The joints of the skull are the specimens of immovable joints.

Movable joints are of four categories :

(a) Ball and Socket Joints.

In this kind of joint the round end of a long bone fits in the socket of another bone. The bones in these joints are so placed that the interlinked bones can be moved freely. The shoulder and hip joints are the unique examples of this category of joints.

(b) Hinge Joint.

In this variety of joint the joining bones can cause action forward and backward. The action of these joints is similar to the action of the upper lid and lower part of a box joined by a hinge. The elbow, knee and finger joints fall in this category. The unique thing about these joints is that the joining parts can move forward

and backward but not sideways. There is a large number of such joints in our body.

(c) Pivot Joint.

In this kind of joint one bone forms a peg and the other moves over it. This joint is found between the atlas and the axis vertebrae. The head can easily be moved forward, backward or sideways position on the basis of this joint.

(d) Gliding Joint.

Under this category of the joint, one bone is joined by the other through a cartilage. This joint possesses the quality of gliding to some extent. The wrist bones and the vertebrae of the spinal chord are interconnected on this principle.

Formation of Movable Joints

The bones on each joint are tied by white ligament fibrous bonds. The action of these ligament fibrous bonds are rope-like. They keep the bones in their proper places. There are muscles on the joints which are joined with bones through the white ligament fibrous bonds.

There exists an efficient arrangement of keeping the joints intact. At this spot (joint) the ends of the two joining bones have a fibrous membrane which is very strong and tape-like in shape. There is one more thin membrane which makes a peculiar type of sack at the ends of the bones. This sack is called the capsule of the joint. There is a layer of cartilages on the ends of the bones in this sack. This cartilage, too, is covered by a smooth and very thin membrane. A smooth oil-like lubricant continuously comes out of this membrane which protects the bones from striking against each other. This liquid acts like a lubricant in a machine, and ensures functioning of these joints.

Functions of the Joints

Joints are very essential for the skeleton. In the absence of the joints, the man can neither move his hand or feet nor move from one position to another. Had there been no joints, all the bodily movements would have an impossibility and there would have been no movement in the man. Then, he would have been just like a wooden statue. The uniqueness in the human body lies in the fact that the joints are according to the needs of a particular portion. The utility of each organ of the body depends on these joints.

Unhealthy State of Joints

When defects appear in joints the functioning of the various organs, too, become defective. The knee-joints generally fall victims to defects. Defective knee-joints are very common among many players. Under defective joints they feel pain during movement of the body from one position to another. Walking, sitting or standing becomes a painful process for players with defects in their joints. Similarly, other joints, when in a state of unhealthiness, cause pain in the movement of organs concerned. Chronic pain in joints often results in tuberculosis or rheumatism. The hip and the knee-joints commonly suffer from rheumatism.

Sometimes the bones of joints are dislocated. Such a dislocation makes the affected parts motionless and useless.

The children who suffer from such a dislocation of bones should be given leave from the school and advised to take rest. They should further be advised to take nutritious food and inhale fresh air.

Bone Diseases

Many diseases often appear in the bones of children. The cause generally lies in the inadequate and unhealthy diet, lack of mother's milk, use of tinned milk and lack of fresh milk. Unhealthy home atmosphere, lack of fresh and open air and sunlight are factors which, too, contribute to bone diseases. Malformation occurs in the bones in individuals living in unhealthy conditions and the following changes appear in their bones :

- (a) **Square Head.** Due to defects caused in the bones of the skull, the head often becomes square and forehead bulges unusually forward.
- (b) **Beaded Ribs.** The chest becomes somewhat thick at the spots where cartilages join the ribs.
- (c) **Pigeon Chest.** This deformity is caused by the defects in the chest bones. Consequently, sternum bulges forward causing cavity on one side.
- (d) **Curved Spine.** The vertebral column bends on one side when there are defects in its bones and kyphosis appears. Sometimes it turns on one side resulting in scoliosis.
- (e) **Softened Bones.** Children's bones are soft and are likely

to become deformed due to unusual pressure. Sometimes, when the child starts walking, some defects develop in his leg bones and they become deformed. As a result of this deformation, knees turn thick, leg muscles become slanting and feet turn flat. Besides, other deformities, too, are caused. The ends of the long arm and leg bones become particularly thick.

- (f) **General Debility and Yellow Complexion of the Body.** General debility and yellowness in children retard the full development of muscles. They turn weak and diseased. Ligaments, too, become loose and weak. Delay is caused in cutting of milk teeth and if somehow they come out decay sets in early. The teeth-roots become weak and turn blackish. Teeth worms appear which cause hollowness in the teeth.
- (g) **Bulging Out Stomach.** Sometimes, it is observed that the stomach of the child unusually bulges outwards giving it more prominence than to other parts of the body. This deformity is caused by soft and weak muscles.
- (h) **Lack of lime salt affects the pelvic girdle** which becomes narrow causing considerable difficulty in easy delivery.
- (i) **Related Development of Nervous System.** As a result of this factor, the child starts speaking, walking and running at a delayed stage.
- (j) **Often defects in bones are the root cause of cold, cough, bronchitis, pneumonia, etc.** Resistance to these diseases is also lowered.

Treatment

1. Particular attention should be paid to physically weak children in schools. Neither hard physical labour nor mental should be forced upon them. Generally, teachers make the child stand in the class for a long time. This practice should be avoided and the physically weak child should, in no circumstances, be subjected to this punishment.

2. Nutritious food is very essential for weak children. Their food should consist of such edibles that abound in calcium and vitamin D. The mother's food, too, should be rich in calcium and vita-

min D. Children of mother having enough calcium and vitamin D do not fall prey to any disease during teething period.

3. Young children generally fall victims to the dreadful disease of rickets. Fresh air is absolutely necessary guarding the children against this disease. They should also get enough sunshine. Their house should be open and ventilated. There should be no dampness in houses. Children should be asked to play in open. Parks very useful in this respect.

4. Children suffering from tuberculosis should be isolated. They should not be allowed to come to school. Sterilised milk should be provided to them. Heliotherapy, too, proves very useful for such children. Focussing of sun's ultra-violet rays on the affected bones is also a very effective treatment of bone tuberculosis.

5. Particular attention should be paid to the sitting positions of the children in order to protect them against deformities like kyphosis. They should be trained to sit and rise properly and stand erect.

6. For removing the ugliness of a flat foot, sufficient rest should be given to the feet. Such feet should be guarded against excessive fatigue. Standing on the toes proves highly beneficial in this deformity. Such children should not wear heavy boots.

SUMMARY

Skeletal structure of the human body is dynamic. It is not a motionless or rigid structure, but flexible and full of motion. This structure consists of 206 bones : 22 in skull, 25 in chest, 64 in arms, 62 in legs and 26 in the back part. Bones are tube-like, and are divided into six categories—(1) Flat (2) Short (3) Long (4) Cubical (5) Irregular and (6) Cuneiform.

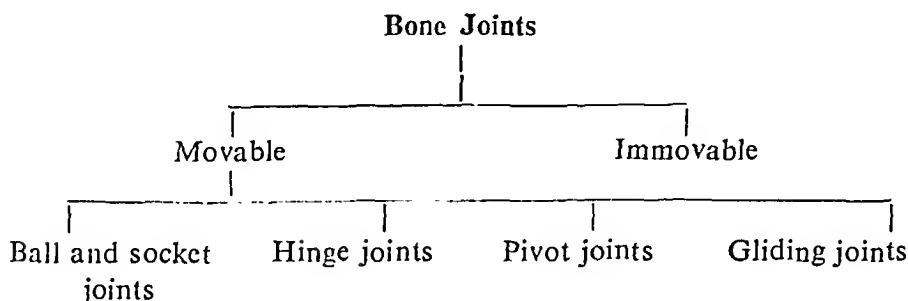
The skeleton is divided into three parts—skull, trunk and upper and lower extremities. The skull is further sub-divided into two parts—(1) Cranium and (2) Face. Cranium has eight, while face has 14 bones.

The trunk includes vertebral column, ribs, sternum, shoulder girdle and hip girdle.

Vertebrae are like a stone-studded ring. They vary according to need and circumstances. Some are small, some are big and many others bear holes in them.

Sternum is like a box in which lie the lungs and heart well-protected.

Upper extremities are divided into six parts—(1) Glenoid cavity (2) Scapula (3) Upper arm (4) Forearm (5) Wrist and (6) Palm. The lower extremities consists of—(1) Hip (2) Thigh (3) Leg (4) Knee and (5) Foot.



The structure of movable joints is unique in as much as they are tied with ligament fibrous bonds. There is a membrane through which seeps out an oil-like lubricant. This helps the smooth functioning of the joints. The joints control and help the movement of the various parts of the body. Defects in the joints cause many diseases. Bone diseases cause a number of deformities in the body causing square head, beaded ribs, pigeon chest, curved spine, flat foot and unusual outward bulging of the stomach.

Following is the treatment for the above-mentioned deformities :

Avoiding excessive physical labour and taking of rest, nutritious food, open and fresh air, sun-light and useful exercises and practising of the proper way of sitting, standing and rising.

EXERCISES

1. What are the special features of the skeleton ? Give a description of bones in various parts of body.

2. Describe the various parts of the skull. What are their functions ?

3. Describe the structure of the vertebral column. What is its relation with the various parts of the body ?

4. Write a short note on the upper and lower extremities of the human body.

5. What categories of bone-joints are found in the body ? Describe them with illustrations.

6. Write a brief note on the structure of movable joints in the body.

7. Throw light on the importance of joints in the body.

8. Which deformities are caused by which defect in the bones ? Give a brief account.

9. What measures should be taken to protect the bones from becoming deformed ?

Chapter Five

Respiratory System

Respiration, the chief work of the respiratory system, is that function of the body through which we inhale fresh air and exhale foul air. This process of breathing fresh air is known as inspiration and exhaling the foul air is called expiration.

Many gases are mixed up in the air and their proportion is as follows :

(a) Oxygen	approximately	·24 per cent.
(b) Carbon di-oxide	„	·04 per cent.
(c) Nitrogen	„	·79 per cent.

Besides, steam dust particles and some other gases are also present.

The air exhaled through expiration has the following proportions of various gases.

(a) Oxygen	16·5 per cent.
(b) Carbon di-oxide	4·04 per cent.
(c) Nitrogen	79·00 per cent.

The above figures show that some part of oxygen is left in the body and in its place 4 per cent more carbon di-oxide comes out. This means that leaving of fresh air in the body and throwing out of foul air is essential in the interest of human body. Blood absorbs oxygen and get purified thereby. This process is very necessary in order to keep the body strong and active. The oxygen after entering the body burns the foul matter. It creates heat and energy in the body in combination with other substances. This indicates the im-

portance of oxygen for us. If fresh air is not available, the blood will not be purified. Consequently, the body will fall victim to many diseases. We should, therefore, inhale as much fresh air as possible and try to live in places where fresh air is in abundance.

All the body functions result in the breaking up of many body cells and this produces carbon di-oxide. Through expiration carbon di-oxide is exhaled out from the body.

We inhale at a time about 30 cubic inches of fresh air into our lungs and during expiration the same quantity of air is thrown out. During long breathing as much as 130 cubic inches of air reaches the lung at a time and the same amount of air is exhaled out also during expiration. In this condition 100 cubic inches of additional air is inhaled into and exhaled from the lungs. Besides this, 120 cubic inches of air is always present in the lungs. Sudden and unexpected injuries cause difficulty in inspiration, suffocation is felt and it becomes impossible to laugh heartily or weep loudly. This situation arises when the stock of reserve air in the lungs exhausts and until that loss is recouped, a hearty laughter or a loud weeping is not possible.

Different Respiratory Organs

The passage through which the air enters the body is known as air-passage. This passage is divided into five parts :

(1) Nostrils, (2) Throat, (3) Larynx, (4) Trachea, and (5) Lungs.

The air-enters the body through nostrils. There are two holes in the nose which have hairs. The entry of dust particles and other small germs into the body is checked by these hairs. These holes are surrounded by cartilages which have a number of holes. They are covered by mucous membrane. A number of capillaries are spread over it. The contact of cold air with them turns it warm and we do not catch chill. Their contact makes the air moist and dust particles and other germs get separated here from the air. Whenever any germ or particle processes its way, these capillaries get irritated and cause sneezing. The unwanted particle or germ is thus thrown out forcibly.

Some people are used to breathing through mouth. This is wrong and harmful. Breathing through mouth does not allow the air to be subjected to the same check and safeguarding process which

occurs during inspiration through the nose. This causes many ills. It is, therefore, advisable to breathe through the nose only. Mouth is for eating purposes, it must not, therefore, be used for inspiration. There are two reasons why some people adopt this unnatural method. One is the habit formed during childhood. It is the sacred duty of the teacher and parents to make the child to give up this habit. The other reason is that sometimes some defects or diseases of the nose compel the child to breathe through the mouth. In such cases some physician should immediately be consulted and proper treatment given to the child.

In the process of inspiration through nose, the air reaches the throat through nostrils and then enters the larynx and trachea. When inhaled through nose, the air passes through a valley-like place. Here is situated the larynx which is made up of cartilages. Its mouth is covered by two pairs of cartilages. There is a hole in its centre. When a man tries to speak loudly, the hole shortens and causes loud voice. But when we speak in a low tone the holes enlarge and low voice comes out. At the mouth of the air-passage above the larynx there is a cartilage cover. This is known as epiglottis. The epiglottis opens during inspiration but closes when a man drinks water or takes food, and as such, water or food does not enter the windpipe. It stops water and food from entering the windpipe. It is never advisable to speak or laugh while eating, because during conversation or act of laughing the epiglottis remains open and there is always the risk of water or food entering the windpipe and causing a violent spasm of coughing. Often this results in serious consequences. One should, therefore, never speak or laugh while taking food. Larynx have vocal cords. Their friction causes sound. These are made up of cartilages.

The pipe below the larynx is called trachea. Its length is about five inches and diameter about an inch. It is not particularly very circular. Its front is no doubt circular but the lower part which is joined with the alimentary canal is plain. This pipe cannot be flattened because there are rings inside made up of cartilages. It is round for the free passage of air. The air reaches the trachea through larynx. There is a layer of mucous membrane in the tube. In the inner layer of this membrane there are very thin hair-like wires. These wires are known as cilia. These remain in action continuously. Their main function is to separate the dust particles from the inhaled air. The windpipe reaches the chest from the neck.

and is divided there into two parts. The right one goes to the right lung and the left one to the left lung. These two parts are further sub-divided into a number of small pipes. This structure of the respiratory system resembles a tree which has two thick branches with a number of smaller ones shooting out from the main branches.

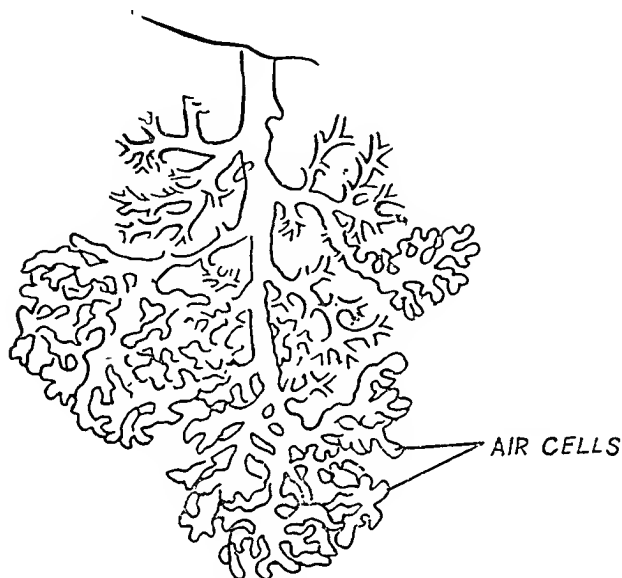


Fig. No. 11 A Bronchial Tube Terminating in Air-cells

The leaves on these small branches can be compared with air-cells. The air inhaled fills in these cells. The air here mixes with the blood and after absorbing the foul matter goes out.

The two lungs situated in the chest are the most important organs of the respiratory system. The lungs are protected in the front by the chest bones or sternum on the back by the vertebral column and by the diaphragm from the below. The colour of the lungs is brown with a slight shade of blue colour. The colour of the lungs of a child before the birth is blood-red and rosy. The right lung is heavier and broader as compared to the left one. Both the lungs are smooth and bright and are like sponge. Each lung is covered by a membrane which keeps it safe. The membrane is two-fold. Its one layer sticks to the back of the lung and the other sticks to the inner chest wall. This membrane is known as pleural

and the space between the two pleurals is known as pleural cavity. Pleurisy is caused when water fills this pleural cavity.

Mechanism of Respiration

The process of inspiration and expirations is a continuing one. If the process stops, the oxygen in the lungs will exhaust and the lungs will be filled in by carbon di-oxide. This function of the lungs is divided into two categories : (1) inspiration and (2) expiration. During inspiration the chest expands. There are two reasons why the chest increases—the first being that the semi-circular diaphragm contracts and takes the shape of a straight line towards the stomach. In this way, some cavity is formed between the lungs and the diaphragm. In this cavity, the lungs expand and are filled in with air. The other reason is that when the muscles between the ribs contract, all the ribs rise upwards. This process creates enough space for the lungs to expand. This expansion of the chest is upwards and not forward or backward. In this way the air enters the lungs and they expand. At this place, the air enters the lungs and they expand. At this place, the tiny blood vessels of the lungs take oxygen from the air and leave out carbon di-oxide.

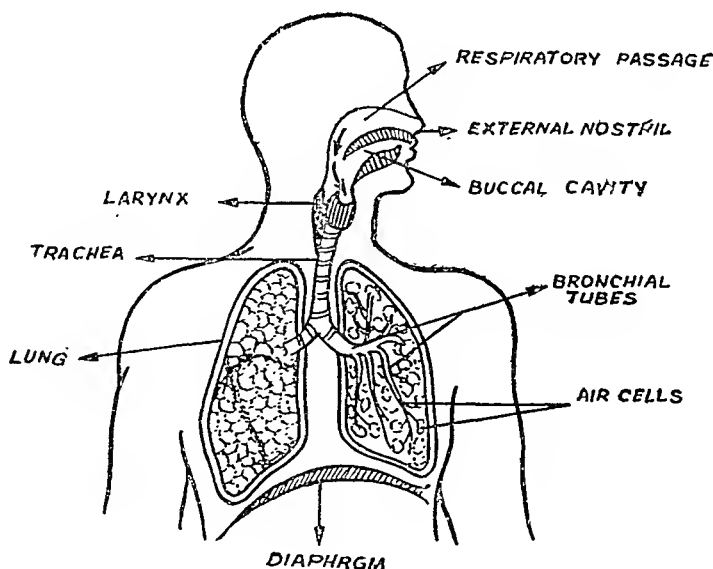


Fig. No. 12 Respiratory Organs

After this process, the air is thrown out through nostrils. The

reason is that the nerves between the diaphragm and the ribs expand. The space reduces and due to the pressure thus applied, the lungs contract. As a result, the air goes out taking with it all the foul matter. This process of exhaling out of the air from the lungs is called expiration. It is worth remembering at this stage that enough air remains in the lungs even after expiration. Only a small portion of the air goes out.

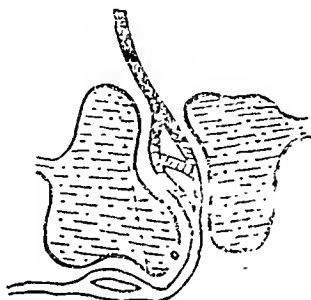


Fig. No. 13 **Air-Cells and Blood Vessels of the Lungs**

One inspiration and expiration complete the process of respiration. A healthy person inhales and discharges air sixteen or seventeen times a minute.

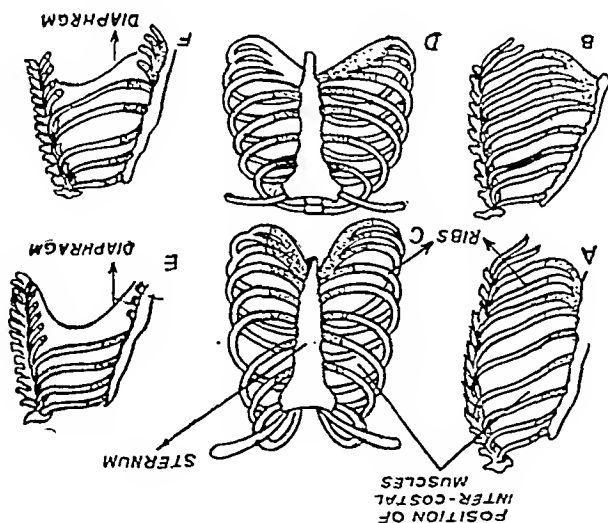


Fig. No. 14 **Mechanism of Breathing**

There is a difference between deep and ordinary breathing. Through deep breathing the quantity of the oxygen that reaches the lungs is larger. How many cubic inches of air a normal man ordinarily inhales at a time and how much air remains in the lungs has already been said earlier. But during deep breathing, a man inhales about 100 cubic inches of air and discharges the same quantity. Deep breathing is very useful because the blood is fully thereby. We should, therefore, develop the habit of deep breathing.

During hard labour or vigorous exercise, the respiration increases. On such occasions, the muscles absorb more oxygen, and carbon di-oxide, too, is produced in a larger quantity. This foul air need to be discharged. It is because of this that the mechanism of respiration works faster. Exercise of hard labour is beneficial in two respects. First, the larger amount of oxygen inhaled purifies more blood ; secondly, the blood circulation, too, increases.

The mechanism of respiration is controlled by respiration centre in the medulla oblongata. The respiration increases when the quantity of oxygen diminishes in the blood and carbon di-oxide increases.

Diseases of Respiratory Mechanism

The following are the common diseases of the respiratory system : (1) Bronchitis (2) Inflammation of Tonsils (3) Adenoids (4) Cold and (5) Sore throat.

Bronchitis

The respiratory tubes get inflamed when germs enter the mucous membrane or during smallpox, influenza, whooping cough etc. Children suffering from rickets, tonsillitis, or adenoids get their mucous membrane inflamed. In tonsillitis, a gland-like abscess is formed behind the soft part of the throat. This compels the child to breathe through mouth. The air inhaled through mouth does not become warm like that inhaled through nose. The respiratory tubes, as a result, catch cold. During winter season, the trouble increases because during that part of the year the resistance power of the mucous membrane against the disease decreases.

Inflammation of the respiratory tubes should immediately be treated, as there is always the risk of getting branchopneumonia. The children suffering from it should be advised complete rest.

Inflammation of Tonsils or Tonsillitis.

Inside the throat on its both sides are two lumps of flesh. In

between them is suspended a very soft piece of flesh. This is known as uvula. It inflammation can cause the following diseases: (1) bronchitis (2) asthma (3) diphtheria (4) bad throat (5) cough (6) common cold (7) headache and giddiness and (8) general debility. Unhealthy and irregular diet, unhygienic conditions of the house, breathing through mouth, defects in the mouth, teeth and nose are some of the factors that cause the inflammation of tonsils.

As a safeguard against these diseases, the inflamed part of the tonsil should be removed through operation. Children should be taught to breathe through nose. Boys suffering from these diseases should be sent to the physician for the proper treatment.

Adenoids

The inflamed flesh joined by a membrane behind the nose cavity is called adenoid. The disease generally occurs during infancy. Chill, cold or measles cause the inflammation of the nasal mucous membrane, as the result of which children fall victim to adenoids. Unhealthy atmosphere, lack of fresh air and sunshine in the rooms or too hot rooms are some of the factors responsible for causing adenoids. Children who use to breathe through mouth also generally suffer from this.

Those children who suffer from this disease are always in a state of restlessness and worry. Their pronunciation is defective. They cannot pronounce properly those words which have nasal accents. In their cases, the nostrils contract. The nose turns flat. The upper teeth show out. The mouth remains open. Their hearing becomes defective and pus is formed in the ears which flows outside. Eyes, too, become dull and eyelids expand unusually covering the pupil. Children suffering from these diseases give a lethargic and foolish look. Their mental development is retarded and they are weak in studies. They lack concentration power. Simple mental exercises tire them out and they generally complain of headache.

The parents of children suffering from adenoids should get them operated. It is the duty of the teacher to inform the parents and advise them about proper treatment of their children. They should encourage their children to develop the habit of breathing through the nose. The nasal and the throat membrane remain in a healthy state in breathing through the nose.

Common Cold

Common cold is caused by the germs which live in the outer

passage of the respiratory tract. The resistance to cold in the body decreases by the inspiration of foul air, by catching cold or by living in damp or dark places. In these circumstances there is the risk of falling prey to common cold.

The symptom of the disease appear after two days. Body shivers, mucous flows out through the nose, eyes get inflamed and turn red, head becomes heavy and every part of the body experiences pain.

This is an infectious disease. The child suffering from it should be given leave and sent home. He should be encouraged to inhale fresh air through the nose. Such children should be advised to sleep in open and keep their feet warm. Massage of mustard oil in the feet proves of great help in this trouble.

Sore Throat

Inflammation in the throat causes this trouble. The throat also becomes sore before the attack of measles, scarlet fever and diphtheria. The glands become harder and cause trouble in eating food. Even it is painful to let the saliva go down the throat.

This is also an infectious disease. The child suffering from it should be isolated. A physician should examine those boys whose glands have turned harder. Sputum should also be examined. Through this check-up, dangerous diseases like diphtheria can be prevented well in advance.

SUMMARY

Oxygen, carbon di-oxide, nitrogen, steam vapurs, dust particles and some other gases are present in the air. During expiration, the quantity of oxygen decreases and that of carbon di-oxide increases. Respiratory mechanism has various organs like nostrils, throat, larynx, trachea and lungs.

It is necessary to breathe through the nose only. It has two benefits: (1) The air is warmed with the contact of nose-hairs, and (2) fould matter, if any, irritates the mucous membrane and it is thrown out through sneezing. These things do not happen when air is inhaled through the mouth.

The air after entering the nostrills, passes through the throat, larynx and teachea, and then reaches the lungs. There in the lungs it fills in the air-cells. Respiration includes both inspiration and expiration. A healthy person's inspiration is normally 16 or 17 times a minutes.

The following diseases are related to the mechanism of respiration :

(1) Bronchitis (2) Tonsilitis (3) Adenoids (4) Common cold (5) Sore throat.

It is necessary to breathe through the nostrils as a preventive measure against the above diseases.

EXERCISES

1. What do you mean by mechanism of respiration ? Describe some diseases of the respiratory system.

2. What do you understand by fresh air ? How does it affect the health ?

3. Give a brief description of the various organs of the respiratory system.

Chapter Six

Circulatory System

The Blood

Blood is a glossy liquid which carries nutrition and oxygen to every part of the body and expels the fould matter produced in them. Whenever any part of the body gets a cut, a bright deep-red coloured liquid starts flowing from the cut part of the body. This bright deep-red coloured object is called "blood". Our body thrives on the blood. The total amount of blood found in a man is one-twentieth part of the body weight. The blood coagulates after flowing out of the body. It is not entirely solid. It has a yellow tinged liquid in it which is called blood. Besides, there is a solid part, too, which is made of minute fibres. It is a net-like object in which suspend disc-like small particles which are known as corpuscles. The fibres are made of a thing called fibrine. It is a kind of protein. The blood corpuscles coagulate because being suspended in this net.

The blood on being seen through a microscope reveals the presence of four different substances in it. These are as under :

- (1) Red corpuscles or Erythrocytes.
- (2) White corpuscles or Leucocytes.
- (3) Platelets and
- (4) Plasma.

Red Corpuscles

The red corpuscles are like small round tablets. These are hollow on both sides. They are so small that if they are put side by side they will total to 100 million in a square inch. When seen through a microscope, each single corpuscle appears yellow coloured

but when put together they appear red. It is because of this that the blood, too, seems red.

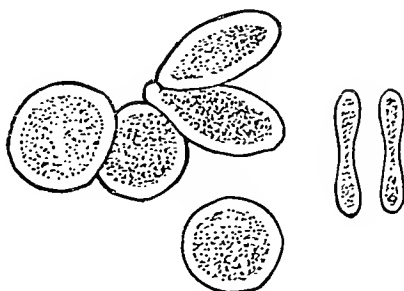


Fig. No. 15 Red Blood Corpuscles

The structure of red blood corpuscles is sponge-like. There is a flexible cover on them. They are filled with red colour which is called haemoglobin. Haemoglobin is a kind of protein in which oxygen, hydrogen, sulphur, nitrogen and iron are present. The unique feature of this object is that it mixes itself with the oxygen. In mixing with the oxygen its colour turns brighter. The blood during circulation reaches the lungs and there it comes in contact with the inhaled oxygen. The haemoglobin immediately takes the oxygen and the oxygen in turn dissolves it. When the blood reaches the various body parts the haemoglobin leaves the oxygen. This oxygen keeps the cells in a healthy condition and helps their proper functioning. Haemoglobin and oxygen combine to form oxyhaemoglobin. Taking oxygen from the lungs and carrying it to be the body cells is the function of haemoglobin. When the cells take oxygen from oxyhaemoglobin only haemoglobin is left. With the going out of oxygen the colour the haemoglobin turns dull and it goes back to lungs to get oxygen again. This is a continuing process and in this way the blood takes oxygen from inspiration and carries it to the bodily cells.

During the pre-natal period, the red corpuscles are formed in the liver and spleen of the child but after birth they are formed in flesh and bones.

White Corpuscles.

In comparison, the number of white cells is lesser than red corpuscles. These are in proportion of 1 to 500, that is, after each white corpuscle there are 500 red corpuscles. Different kinds of

cores are found in the white corpuscles. Their shape is amoeba-like and they differ with the red corpuscles in form. Their shape continuously changes. Sometimes they are disc-like, sometimes they are triangular and on some occasions, they appear projecting like fingers. They are extremely small and are equal to $1/2500$ inch. It is because of their size that they pass through the walls of even small blood veins.

The white corpuscles are of various categories. When some foreign elements enter the body, a category of these corpuscles fights and tries to destroy them. In the case of their failure, the man falls ill. If they succeed, the man escapes the illness. The germs thus destroyed by this category of white corpuscles are eaten up by another category known as phagocytes.

The main functions of white corpuscles in this way are :

1. To fight and destroy the germs of diseases,
2. To eat up the destroyed germs, and
3. To keep a safe zone for the protection of the body.

Platelets

Platelets are even smaller than blood corpuscles. They are formed as a result of fatty food and sunlight. They play a prominent part in protecting the body against various diseases. They develop a different kind of swelling when their number in body decreases and consequently the body becomes weak.

Plasma

Plasma is a red liquid with yellowish tinge in which float both red and white corpuscles. It is formed by 90 per cent of water and 10 per cent of solid substance. These substances are as under :

- (1) There are three types of proteins in the body out of which fibronogen is the most important.
- (2) Oxygen, carbon di-oxide and nitrogen gases, too, are present in it.
- (3) **Uria and uric acid.** These are continuously formed in body and come out of it in the shape of perspiration and urine.
- (4) Fat or carbohydrate.
- (5) Glucose.

- (6) Common and other salts.
- (7) Different kinds of antidotes of poison and other substances that fight the foreign elements and undesirable germs entering the body.
- (8) Glycogen : Changes in glycogen form glucose.

Functions of the Blood

- (1) It carries the oxygen mixed with haemoglobin to the various parts of the body.
- (2) It carried foul air and other harmful products formed in the body to lungs, kidneys and skin through which these undesirable products are thrown out of the body.
- (3) It carried nutrition to every part of the body which helps its growth, for example, protein helps the development of muscles, fat produces energy in the body, sugar makes the muscles active, minerals help the formation of body and vitamins protect it.
- (4) The body temperature remains uniform through blood.
- (5) The white corpuscles protect the body and fight against the invasion of harmful germs like soldier.
- (6) If a part of the body gets cut, the blood flowing out coagulates and covers that portion of the body and its out-flow is automatically stopped.

Circulation of Blood

As has been stated, the blood circulates throughout the body. This action of the blood is known as blood circulation. The question arises naturally as to how this process of circulation takes place.

There are two main parts of the circulatory system : (1) the heart and (2) blood vessels. Blood vessels are of two kinds. The first category with thick walls are known as arteries and the second one with thin walls and carrying foul blood are known as veins.

Heart

The form of man's heart is like a mango or a clenched fist. It is covered by a membrane. This cover is made of fibrous matter.

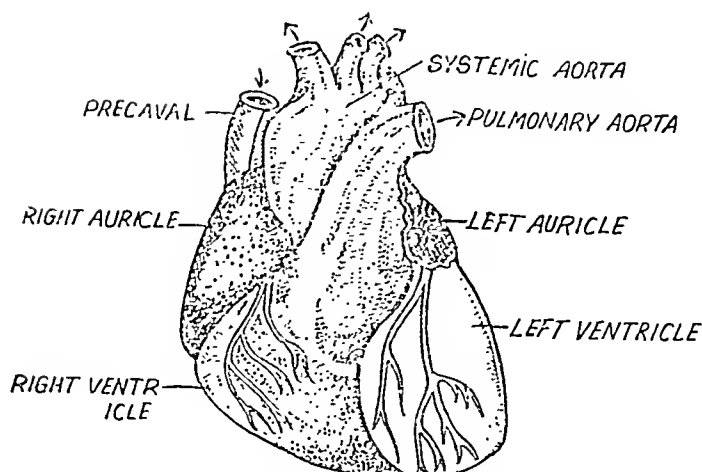


Fig. No. 16 External Structure of Heart

The cover is sack-like. The heart lies safe in this cover. This cover is called pericardium. The walls of this cover are thin but have two layers. A liquid continuous to come out of this cover and keeps the heart wet or rather lubricated. This helps the smooth function of the heart. When the heart relaxed this liquid protects the cover-walls from striking as against each other.

The heart which is made up of muscles, lies in the left side of the chest and is placed in the middle. Its lower portion named apex projects on the left side. The lower part is conical, while the upper is broad. A young man's heart is 4 1/2 inches long and 3 1/2 inches broad. Its thickness is 2 1/2 inches and weights about ten ounces.

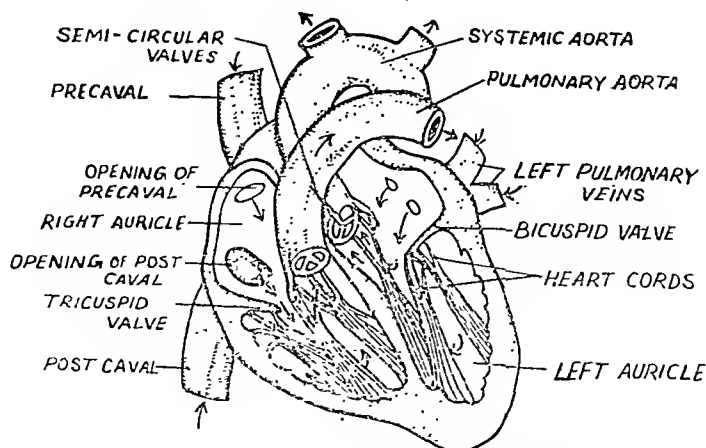


Fig. No. 17 Internal Structure of Heart

The heart is hollow lumps of flesh which in the inner side is divided into two upright parts by a strong fibrous partition. These two parts are independent each other. Each part is further divided into two parts horizontally. This way, a heart is divided into four parts. The upper parts are known as auricles and the lower ones as ventricles. The auricles are smaller in size in comparison to ventricles. An Artery, comes out from the right ventricle and goes to the lungs and another big artery coming out of left ventricles sends the blood to every part of the body.

Each auricle is joined to the ventricle on its side through an auricle-ventricle door. The two doors on both sides are protected by valves. These valves are so formed by fibrous matter that they only open downwards and never upwards. They only allow blood from auricles to ventricle but not vice versa. These valves may be compared with tube valves of a bicycle or a mouse-trap. The air can only pass into the bicycle tube, but cannot come out, as the mouse can only enter the mouse-trap but cannot come out, so is the function of these valves of the heart.

The right side valve is called tricuspid and the left side one is known as bicuspid because they are made up of three and two flaps respectively. From valves to ventricles there are flesh bonds which holds the valves so tightly that they cannot open towards auricles. These valves separate when cells in auricles contract and allow the blood an easy passage to ventricles. These ends of the valves rise upwards and meet together again when the blood flows out of ventricles. As the results of this the blood cannot flow back from ventricle to the auricle. There could have been a possibility of flaps instead of meeting each other moving towards the auricles and remain open thus allowing the blood to travel back from ventricle to auricle but because of the above described arrangements the blood cannot move towards the auricle. The results is that the blood cannot travel from ventricle.

Functions of the Heart

The function of the auricles is to take in the blood and that of ventricles is to let out the blood. These are thus formed according to the need. The walls of ventricles are thicker than those of auricles so that more blood may come in. Each ventricles can accomodate about two to three ounces of blood. The auricles can take in lesser quantity of blood.

The entire impure blood of the human body enters the right auricle through the superior and inferior veins. When the blood is accumulated in it, contraction takes place as the result of which blood goes to the right ventricle. The right ventricle, too, contracts on the arrival of blood and the blood thus reaches the lungs through lung's arteries. In the lungs the blood comes into contact with the oxygen and is purified. This purified blood goes to the left auricle. Four arteries carry this purified blood to the left auricle. These are known as pulmonary veins. When the blood flowing through these four pulmonary veins accumulates in the left auricle, the function of contraction starts and the blood then is allowed to go to the left ventricle. From here the blood goes to every part of the body through small arteries. For the performance of this difficult function there is a big artery coming out from behind the left ventricle. This thick artery is called systemic aorta. At the root of systemic aorta are semicircular valves. The blood flows from systemic aorta on the opening of these valves. These valves are similar to cell valves in heart. They only allow the blood to flow out from the left ventricle in the systemic aorta, but the blood cannot flow back from the systemic aorta to the left ventricle. The blood then flows into many

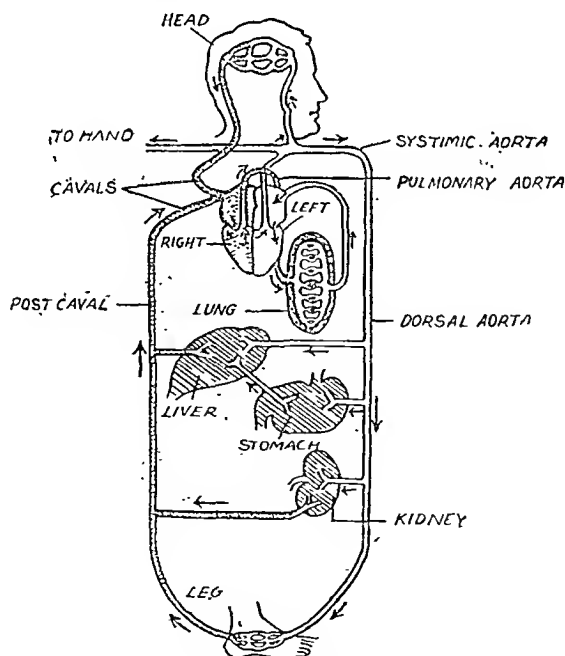


Fig. No. 18 Blood Circulation

small arteries from the aorta and reach every part of the body carrying oxygen and nutrition to them. After performing this function, the blood becomes impure and reaches the veins through capillaries. It again enters the right auricle and the cycle goes on again and again.

The heart beats automatically. It is not motivated or put into action by any other power. The beats at times increase and decrease. The heart beats due to the following the nerves : (1) Vagas and (2) Sympathetic. Vagas decreases the heart-beats while sympathetic increases it. The heart-beats produce a sound which is clearly audible. It sounds like "Lav Dhak". When the heart relaxed the sound is 'Lav' and when it expands the sound is 'Dhak'. The heart-beats of a child are 120 per minute. In the case of an adult, the heart-beats are 70 times a minute and 80 times in the case of old persons.

Artery

It has already been said earlier that arteries circulate the blood in the body. The tubes that carry blood from heart are called arteries and those which carry blood to heart are called veins. Arteries carry deep-red coloured purified blood from the heart. Only one artery does not carry purified blood. This artery is known as pulmonary artery. The only function of pulmonary artery is to carry impure blood from the right ventricle to the lungs. Arteries are the very important part of the human body. If somehow they are cut, the man will die immediately. It is because of this that they are placed in safe positions. They lie between the thick flesh walls and bones.

Arteries rise and fall down continuously. With the relaxation of the left ventricle chamber the blood rushes into these arteries. With the rushing in of the blood the arteries expand and with its moving forward they relax and come to their original condition. The expansion and relaxation of the arteries is called the pulse. There is a sort of vibration in them which can be felt by the finger. These vibrations occur at 13 places in the body. These places are called pressure points. When an artery is cut, the blood spurts out. Under such conditions, tourniquet should be used to stop bleeding. The knowledge of using tourniquet is necessary for the teachers as well as the students.

There is an artery called aorta that carries pure blood from the right side of the heart. The artery gets divided into two parts after

proceeding to same distance. The one part carries blood towards the neck and the head and the other part to the hands. The aorta turns downwards. It supplies blood to various parts and again gets sub-divided into two parts. Each part goes down towards each leg and supplies pure blood. These parts are known as lower arteries. For providing blood to the muscles situated in the middle part of the body, stomach and other extremities, many branches shoot out from the main aorta. A smaller artery sub-dividing itself into three branches supplies blood to stomach, liver and spleen. Two other arteries provide blood to various parts of the thigh. Two arteries supply blood to both the kidneys. The main artery after going down the kidneys is further sub-divided in two branches. Its one branch supplies blood to the pelvic girdle and the other branch again dividing itself into two parts supplies blood to the thighs. Many of its branches supply blood to the various parts of the leg.

Capillaries

The above description of the aorta shows that dividing itself into many branches it supplied blood to the entire body. The blood during this process flows through very narrow and small arteries. These very small arteries are called capillaries. Through these capillaries the blood reaches and supplies oxygen and nutrition to the various parts of this body. During the process of supplying oxygen and nutrition, it collects and absorbs the foul matter.

Capillaries are made like cells. Some of them are so narrow that only one blood corpuscle can move in it. The network of capillaries is extended all over the body. The walls of these capillaries remain just near the cells. The result is that some portion of the blood flowing in the capillaries seeps down through the walls and reaches the cells and the cells in this way get nutrition. Besides, these cells take oxygen from it. During this process the foul air carbon di-oxide of the cells dissolves in this blood. The colour of the blood in the capillaries thus becomes dirty. (See Fig. No. 19)

Veins

The impure and dirty blood of the capillaries returns to the heart through the veins. After giving oxygen and nutrition to the body-cells and absorbing the carbon di-oxide, the capillaries join each other. This joining process results into the creation of pipes or tubes which are called veins. This impure blood reaches the right auricle-chamber passing through smaller and bigger veins for puri-

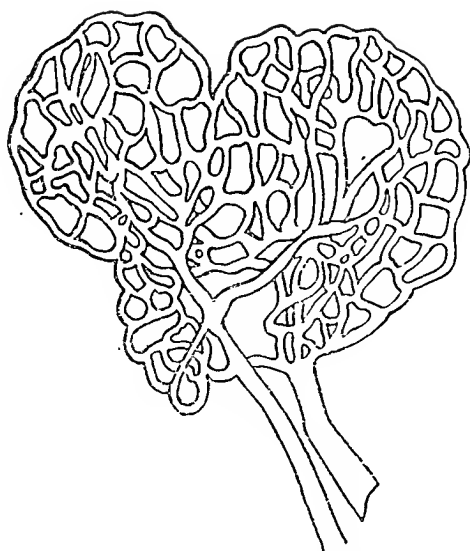


Fig. No. 19 The Network of Capillaries

fication. The purification process starts as soon as the blood reaches there.

Veins are of two different categories. The veins in the first category are known as inferior vena cava. The others are known as superior vena cava. The joining of the two veins of both the lower parts of the leg and of the veins of pelvic girdle form two major veins and when these two combine a big vein is formed below the meeting point. As this vein proceeds upwards it becomes thicker because the smaller veins of the stomach region, too, join it. It passes through a hole in the chest diaphragm and enters the lower part of the right auricle. In this way, this vein carries the impure blood of the lower part of the body for purification in the heart.

The upper major vein performs the function of bringing the impure blood of the head, neck, both the arms and the chest for purification into the heart. It enters the upper part of the right auricle-chamber. In this way, whatever quantity of the pure blood flows out of the left ventricle-chamber into the arteries for providing oxygen and nutrition to the various parts of the body returns impure through these big veins into the right auricle-chamber. From there passing through the right ventricle-chamber it reaches the lungs through pulmonary arteries for purification. After purification, the

blood flowing through two pulmonary veins passes through the left auricle-chamber and reaches the left ventricle-chamber from where it goes to the aorta. In this way, this cycle of blood circulation continues day and night.

Expansion and Relaxation of Chamber.

The important aspect of the blood circulation is that the relaxation of chambers move the blood forward. After forcing the blood to move forward through relaxation, the chamber starts expanding and again is filled with blood. To move the new accumulated blood the chamber again relaxes. This process of expansion and relaxation of chamber continues non-stop throughout the life. Both the auricle-chambers are filled with blood at the same time and they, too, relax simultaneously allowing the blood to pass to the ventricles. In the same way, the ventricles, too, are filled with blood at the same time. They also relax and push the blood forward at the same time. The auricles relax first and the ventricles later. Afterwards all chambers of auricle and ventricle relax giving the heart time to relax. Then again all the four chambers expand and relax. The heart thus expands and relaxes 70 times during a minute.

Proofs of Blood Circulation.

William Harvey, the first man proved during the seventeenth century the theory of circulation of blood. The following proofs are particularly important in this respect :

- (1) The blood rushes out at a high speed when an artery is cut. The only reason for this high speed of the rushing out blood is the beating of the heart.
- (2) The valves are so made that they allow blood in one direction only.
- (3) Poison in a blood vessel reaches the entire body.
- (4) If the artery of a living man is tied up, it expands towards the heart and narrows in the other direction due to the stopped flow of blood.
- (5) During the time of the artery-cut pressure applied towards the direction of the heart stops the flow of the blood.

Lymphatic System

It has been already stated earlier that at the time of blood flowing in the capillaries, a water-like liquid from the blood seeps down

through their thin walls and reaches the cells. This liquid is known as plasma. This liquid is not a coloured one. In it are present nutritious substances for the cells, like water, protein, sugar, fat and mineral salts. There are also present in some white blood corpuscles which had come out of the walls of capillaries. The walls of capillaries between the blood and cells in this way supply nutrition to cells through plasma. The plasma absorbs the foul matter produced by the actions of tissues.

Besides the blood capillaries, there are other varieties of capillaries known as lymph capillaries. After giving the nutritious matter and taking the foul matter, some portion of plasma flows back in the capillaries. The remaining very small portion of the lymph flows at the place from where the lymph capillaries start. These tiny capillaries join to make bigger lymph carrying capillaries. There are two capillaries of this kind. The smaller and the bigger one. The bigger one is 15 to 18 inches long and starting in front of the second vertebra of the stomach and waist region it passes through the middle stomach muscle and reaches the chest. From the chest it proceeds above the left collar-bone and joins the branches of the chin and upper veins. It is called Thoracic-duct lymph capillary. The blood flows in it from the major part of the chest, left arm, chin and the left part of the head. The upper tube joins the lymph capillary with the blood of the veins below the right collar-bone below the right part of the chin. In this way, the plasma or lymph comes out of the blood from the whole body, is collected and again is mixed in the blood, through these two capillaries.

Lymph capillaries are generally like veins in appearance. The walls of these capillaries are thinner than those of veins. It is because of this fact that they remain flat when empty and are difficult to trace. These capillaries generally pass through glands. One capillary is joined at one end of the gland, while the other at the other end. Lymphatic capillary enters the gland through the first end of the gland and goes out from the other end. These glands are found in arm-pits, neck, thigh-pits and other similar places. These glands are called lymphatic glands. These lymphatic glands are oval in shape like an egg and vary in size from a mustard seed to beans. In these lymphatic glands exists a fibrous network and those phagocytes or blood corpuscles that fight the germs of various diseases and protect the body from them remain suspended in this network. These glands serve the purpose of filter for the lymph. It

separates the germs and other foul matter which are destroyed by phagocytes. When phagocytes turn weak and germs of the various diseases prove stronger to them there appears pain in these lymphatic glands.

Common Diseases of Lymphatic Glands :

- (1) Inflammation in the neck glands due to measles.
- (2) Inflammation in the lymphatic glands of the neck due to poison produced from bad teeth.
- (3) Injury in the hand causes swelling in the arm-pit glands.
- (4) Injury in the leg causes swelling in the thigh-pit glands.
- (5) Tuberculosis also affects the glands.

Due to the above causes, defects arise in the glands and besides swelling pus is also formed and it opens causing pus to flow.

Inflamed glands should be fomented. Poultice also proves useful. Such children who have inflamed glands should be advised to go through medical examination.

Common Blood Diseases

Anaemia

Anaemia is caused by the change in the form, number and action of the red corpuscles. This falls into two categories, namely, primary anaemia and secondary anaemia. In the primary stage of anaemia, the bone marrow stops its function of producing red corpuscles as the result of which body turns anaemic. Chlorosis and pernicious are the outstanding examples of this category of anaemia. The other category of anaemia is ordinary and is caused by defect in the blood.

Anaemia is caused by excessive bleed from any part of the body, lack of food, lack of iron, salt or vitamins in the diet lack of sun-light and fresh air, germs in the stomach or intestines etc. Anaemia is also found in persons suffering from diphtheria, rheumatism, inflammation of kidneys or defects in the diet, lack of sun-light and fresh air, germs in the stomach or intestines etc. Anaemia is also found in persons suffering from diphtheria, rheumatism, inflammation of kidneys or defects in teeth and gums.

The lips of the children who suffer from anaemia are not reddish. Such children turn yellow and are lazy. They suffer from headache and get exhausted after a little labour. They do not feel

hunger and food becomes tasteless for them. Such children should immediately be examined by some physician and rest should be provided to them. Efforts should be made to remove the deficiency of iron and salts in the haemoglobins. Open and fresh air is very beneficial to persons suffering from anaemia.

Heart Diseases.

The diseases of heart may be divided into three categories—(1) Congenital, (2) Acquired and (3) Functional (creating disturbance in the functioning of the heart).

Congenital Diseases. Due to narrow passage of the pulmonary artery in the right ventricle or the defective division of the chambers of right or left ventricle less blood mixes and this causes anaemia. The mixing of blood depends on the small or large size of the fibrous division.

Acquired Diseases. This is caused due to the valves or the muscles being affected by rheumatism, diphtheria, scarlet fever, measles. Some other diseases also give rise to this trouble. When the valves do not function properly, it results into additional pressure on the heart. Consequently, the heart becomes weak. Those children who are the victims of this trouble are soon exhausted and their respiration considerably increases. Swelling also develops in their feet.

Functional Diseases. This trouble appears when the functioning of the heart gets irregular. The heart-beats sometimes either increase or decrease considerably. The digestive system, as a result, becomes irregular and the man becomes anaemic.

Children suffering from heart diseases should not be made to work hard. Provision should be made to give them as much rest as possible.

SUMMARY

The blood is divided into four categories : red corpuscles, white corpuscles, platelets and plasma. The number of red corpuscles is considerably high as compared with that of the white corpuscles. White corpuscles are the protectors of body. Platelets, too, perform this function. It is produced by fatty food. In the plasma protein, carbon di-oxide and oxygen exist.

The main function of the blood is to carry oxyhaemoglobin from the lungs to every part of the body and also to carry foul air

and other foreign and harmful products to kidneys and skin for being expelled out from the body.

The heart has four parts, the two chambers of the upper part are known as auricles and the lower ones as ventricles. The auricles take in the blood and let it go into the various parts of the body.

The impure blood travels from the right chamber of the auricle to the right chamber of the ventricle and from there through two pulmonary veins to lungs where it comes in contact with oxygen and gets purified and travels back through two pulmonary arteries to the left chamber of the auricle, from there to the left chamber of the ventricle and then to the aorta. From aorta to smaller arteries, then to capillaries. From capillaries to superior and inferior veins and then again to the right chamber of the auricle. This is the cycle of the circulatory system.

The tubes that carry blood from the heart to the various parts of the body are called arteries. From small and narrow arteries blood travels into still narrower and smaller ones called capillaries. The foul blood from capillaries is carried by tubes called veins. It is through veins that the blood returns to the right chamber of the auricle.

From the blood comes out a liquid through the capillary walls. This liquid is known as plasma. The tubes that carry plasma are called lymphatic capillaries.

Anaemia, and congenital, acquired and functional diseases of the heart come under the disease the circulatory system.

EXERCISES

1. Write a note on the blood circulation in the body with the help of a sketch.
2. Prove that the white blood corpuscles are the protectors of the body.
3. Describe in short the human heart.
4. What do you know about artery, capillary and vein? Explain in detail.

Chapter Seven

The Excretory System And Skin Diseases

Due to activities in the body some useless products are produced throughout. The waste and harmful products need expelling out of the body; otherwise due to them poison is likely to spread in the body. The process of expelling of these waste and harmful products out of the body is known as excretion and the system is called excretory system. The organs that takes part in this process are know as excretory organs. The following are these organs :

(1) Kidneys, (2) Skin, (3) Lungs, (4) Bowel.

Kidneys

The part of body where urine is produced is called kidney. There are two kidneys in the body—the right one and the left one. These are situated in front of the last ribs.

Kidneys are deep-brown in colour. These are surrounded all round particularly in the rear with fact. There is a small gland on the upper part of each Kidney. The shape of the kidney is like a bean. Kidneys are four inches long and two and a half inches broad.

Like the been the back portion of the kidneys are projecting. Their outer edge, too, is projecting. The inner portion of the kidney near the vertebral column is pressed inwards. In this part the artery enters and the vein comes out. This part of the kidney is known as its mouth. The ureter also originates form here and goes down to the bladder. There are two ureters; each coming out of a kidney. The length of the ureter is about 15 inches. They are just like rubber tubes in shape. The urine flowing through these tubes (ureters) is

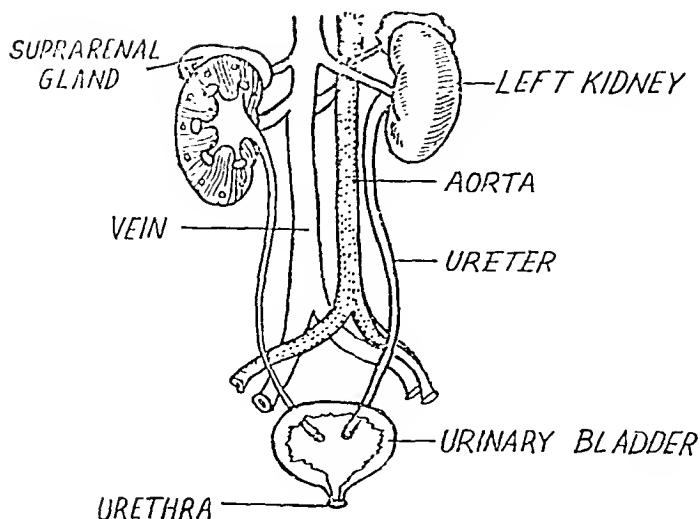


Fig. No. 20 Excretory Organs

collected in the bladder. The bladder is a sack made of muscles and lies in the pelvic girdle. When the bladder is filled with urine it contracts and the urine goes out through urethra. The action of urethra is controlled by voluntary muscles. The man feels the need of urinating when about six or seven ounce of urine is collected inside the bladder. At the mouth of urethra the flesh of kidney wall contracts and blocks the outlet of urine but when a man wants to urinate the walls loosen up and the obstruction at the mouth of urethres is removed. At this time, the urine comes out of the bladder and passing through urethra goes out. The major portion of the urine is water and the rest comprises of some chemicals. These chemicals remain dissolved in the water in the following proportion :

Water	95·6 per cent
Uria	2·0 per cent
Salt	·6 per cent
Others	·8 per cent

The urine of a healthy man is free of sugar and protein, but in a sick man these things are found in larger of smaller quantities. The urine of a healthy man is wheatish in colour, in the sick one the colour beoomes yellowish, Sometimes it turns reddish as well.

Structure of the Kidneys

The kidney is surrounded by a membrane. This membrane cover is called kidney bladder. Fat also covers it on all sides. If

the kidney is cut through from one end to the other by a knife, the colour of the cut portion would appear to be black. Its formation is crystal-like or granular. Its inner portion is comparatively of lighter colour. The formation of kidney's middle part is stripe-like and is constituted of very thin capillaries. These very thin capillaries join together and become tower-like. These tower or minarets have small holes at the end. These holes are called mouths of bigger capillaries of the kidneys.

Kidneys are the lumps formed by the collection of groups of small and thin capillaries. Besides, the kidneys have nerves, arteries, veins and lymphatic capillaries. The top part of the capillaries is disc-like and thick. It is situated in the back of the kidney. This portion is flat in the centre where there are blood capillaries. Each capillary passing through this swelled portion joins the other capillary. When a number of smaller capillaries join thus, a big capillary is formed. The minarets of the liver are formed of such bigger capillaries. The urine comes out of the mouth of these capillaries and reaches urethra.

Functions of the Kidneys

Blood reaches the kidney through the branches of aorta. This artery is divided here into many branches. These smaller branches of the artery enter the mouth of each capillary. Through it blood reaches the capillaries. The plasma come out of the walls of these arteries, and reaches capillaries through their walls. The inflamed part of the capillary serves the purpose of a filter. Some part of the plasma is filtered through them.

The blood comes out of the groups of the capillaries through a tube. Coming out the blood from here spreads itself in the network of capillaries in the remaining portion of the tube. These capillaries lie besides the cells and take in the seeped uria and uric acid, etc. from the lymph and then carry it to the tube. These substances (the uria and uric acid, etc.) mix up in the tube with that water which seeps from the rear inflated part of the tube. This water flows through small tubes and reaches the bigger tubes of the minarets. Coming out of the holes of these minarets the water reaches the upper broader of the ureter. This water-like object is urine. It is thus clear that the blood reaching the kidneys gets purified and leaves the foul matter in the shape of urine which flow out of the body from there. A healthy and normal man urinates

from about a quarter and seer to a seer and half urine during twenty-four hours.

Skin

The skin protects the body like an armour. Its cells are continuously damaged and formed as well. It has got two layers : (1) Epidermis, and (2) Dermis.

Epidermis is that covering part of the body which separates from the body when a hot liquid falls on the body or when some strong medicine is applied on the skin. The thickness of epidermis is not uniform throughout the body. Its thickness is $\frac{1}{24}$ inch at the sole and $\frac{1}{200}$ inch on the face. The epidermis is comparatively harder than dermis. This is made up of many layers of epithelial cells. Its cells are thinner and flatter than the lower cells but they are hard like the cells of the heart. They protect the lower cells and continuously get emaciated.

In the lower cells of the epidermis there are colour producing particles. It is these particles which give white, black, brown, or wheatish complexion to the skin. These are found in abundance in the skins of Africans while they are found in lesser number in those of Europeans. It is because of the large number of these colour particles that Africans have black complexion. These colour-produ-

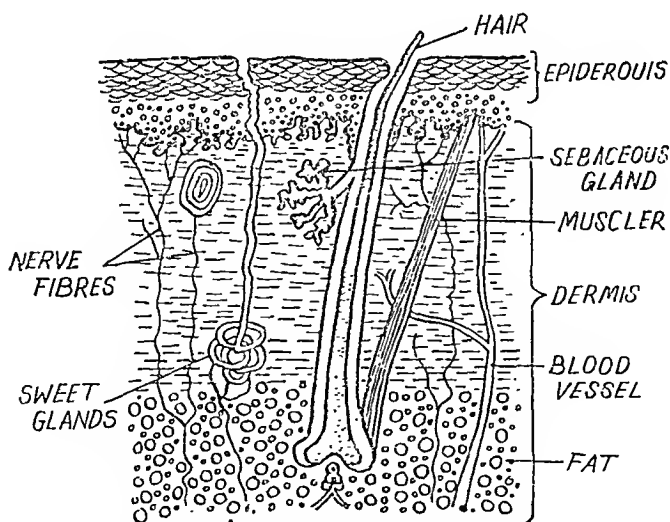


Fig. No. 21 Skin Longitudinal Section

cing particles are changeable. Their number increases or decreases according to the climatic conditions. The colour particles are found

in large numbers in the inhabitants of hot regions, because the colour particles help the body to resist the heat. The man faces the climate of the hot countries with the help of these colour particles.

There are no blood-carrying capillaries in the epidermis. The cells in it get nutrition from the lymph. It seeps from the dermis. There are no nerves in the epidermis. It is because of this that man does not feel pain if these are cut.

There are a number of pores in the epidermis which could be seen through microscope. Some foul matter of the body seeps out of these pores in the form of perspiration.

On the walls of the inner cavities of the body (mouth etc.) there is a thing rosy mucous membrane. The uniqueness of this membrane lies in the fact that it soon absorbs the dissolved substances. There is no such thing in the epidermis.

The real skin lies beneath the epidermis which is made of connective tissues. It is thicker and stronger than the epidermis. The connecting tissues are joined strongly in the upper part, but are loose in the lower part. There is a lot of fat in it. The projecting parts of the body are filled up by this fat and it makes the body fleshy. It also keeps the body hot and checks heat from escaping out of the body. In the dermis are present the nerves, lymphatic capillaries and veins.

In the outer part of the skin are the projection of fingers. These projections are called papillae. They are situated like parallel lines. In the centre of a papillae is a bunch of blood capillaries and oval part of flesh which is called touch corpuscle. We feel the touch, pain and temperature through them.

Two varieties of glands are found in the skin (1) sebaceous glands and (2) the sweat glands.

Sebaceous Glands

These are small sack-like objects from which comes out oil-like smooth liquid. The liquid coming out of each sack through a capillary reaches the hair root. The hair and the skin remain glossy due to this liquid. These glands are not found in the palm or the sole of the foot.

Sweat Glands

Those glands are found in the lower part of the dermis. They lie like snakes in the lower tissues of the dermis. These are tubes-

like and are surrounded on all sides by the blood capillaries. When the blood flows through the capillaries, the cells of these glands take from the seeped plasma water, uria and other harmful products. This water is known as perspiration. It evaporates out of the body through the pores of the epidermis. If it is in large quantity, it is changed into drops and does not evaporate. Sweat is of two kinds. One which is invisible and evaporates as soon as it comes out of the body. The other kind of sweat in the form of sweat is visible and appears on the body. The quantity of sweat coming out of the body depends on the climate and hard work.

Perspiration is useful in more than one respect. It keeps the body at a uniform temperature. During the summer season or during hard work when heat is generated in the body perspiration starts. *It causes the body to remain cool. In this way perspiration keeps the body cool in summer.*

Nails and Hair

Epidermis produces nails and hairs. When the cells of epidermis become hard these two things are formed. In the roots of nails there are a number of blood capillaries which are covered by the cell of epidermis. These cells grow rapidly. On coming outside, these turn hard. The nail grows in this fashion.

Hairs are the projections of epidermis. In the root of each hair is a deep and very narrow pore. There is a gland in its root which is called sebacious gland. This gland produces oil-like liquid which keeps the hair soft and glossy. Each hair has a muscle in its root. The hair stands when this muscle relaxes.

Functions of the Skin :

- (1) The skin covers the entire body and protects the muscles beneath it.
- (2) Keeps the body temperature at a uniform level by expelling the heat through sweat.
- (3) Makes the body feel the touch and the heat.
- (4) Foul matter is thrown out of the body by the skin.

Protection of Skin and Hair.

The body if not kept clean in a regular way begins to emit foul smell. The dust particles and the foul matter of the sweat sticks to the body causing obstruction in the outlet of harmful matter through

the innumerable pores on the skin. This state of affairs tells adversely on the health of the individual and numerous boils appear on the body. The body falls victim to a number of skin diseases. It is, therefore, necessary to teach the child the importance of cleanliness of the body.

Common Skin Diseases

If the skin remains unclean and dirty, a number of infectious skin diseases take root on the body. Sometimes, the results are serious. A brief description of some of the skin diseases is given below :

Impetigo.

This disease is generally found among the children of poor families. It is caused by a particular germ. In this disease many small red rashes appear on the face, chin, head, hands and other parts of the body. Sometimes, Blisters also appear on these rashes. When the rashes dry, yellow hard crusts are formed on it and there is etching in them. When children use their dirty nails over the itching parts, the germs enter into nails and other children may also catch the infection.

Children suffering from impetigo should be isolated and other children should not be allowed to touch their things. Other children should be examined to find out if they, too, are suffering from this disease. The lavatories and the bathrooms of the institution should be examined and kept clean. The useless part of the nail should be cut so that it may not be used in irritating the affected part. The yellow hard crust should be removed first of all. The affected parts should be washed with boric acid mixed with hot water. Sulphona-mide ointment should then be applied. The ointment prepared with mercury also may be applied.

Itch.

This is an infectious disease which is caused by a particular type of germ. The germ penetrates the epidermis. It generally affects calves, leg, wrist and in the space between two fingers.

In this disease small pustules appear on the affect part. Gradually, they develop in bigger ones and cause siolent itching. Pus is also formed and sometimes the pustules from abscess.

One should avoid the company of a man suffering from this

highly contagious disease in order to save himself from falling a victim to the same. All the things used by the patient should be disinfected. The children suffering from this disease should be granted leave of absence. Proper treatment should be given in consultation with the physician.

Hot water bath and rubbing of the affected part destroys the germs. After the hot bath, an application of sulphur on the whole body proves beneficial. Bensoyl Bensonate is also useful. Its solution should be applied on the affected part and allowed to be dried up. The process should again be repeated. On its being dried up, the patient should take a good bath with germ-killing soap. This process will destroy the germs and the patient would soon recover. The clothes of children suffering from this disease should daily be disinfected.

Exczema.

In exczema the red rashes appear in the beginning as the result of which the skin turns rough, watery and thick. Later on, hard crusts are formed on the rashes. Children of about five years in age commonly suffer from it. Such children should be given leave and advised proper treatment.

Ringworm.

It is of four categories : (1) Skull ringworm, (2) Leg or thigh ringworm, (3) Chin ringworm and (4) Body ringworm.

Particular germs in the above-mentioned parts of the body cause ringworm of the part concerned. *Tinea Tonsuraus* in the skull, *Tinea Morginate* in the legs of thighs, *Tinea Sycosis* in the chin and *Tinea Circinate* cause ringworm in the body. These germs attack the skin at the root of the hair. This is also a contagious disease.

First of all, a red patch appears on the affected part. The rash is generally one and half in diameter. It is circular and projecting. In the centre it is all-right but spreads towards the edges. Irritation is felt in the affected part at times.

Children suffering from ringworm should be given leave to avoid the contagion. The disease is cured by applying tincture of some suitable ointment at the affected part.

Skull Ringworm.

As a result of ringworm on the skull, round patches appear

over the head causing the affected part in order to give a rosy appearance. The affected part also appears to be covered with scales. There is some inflammation too. The germs in this case penetrate the hair-root and make them weak so that hairs began to fall. Gradually, these germs attack the nearby hairs and destroy them as well. This affects the entire head as the result of which new rashes appear over the entire head.

No sooner the first symptoms of head ringworm appear on the head of the child, he should immediately be examined by a physician. He should be granted leave from the school till he fully recovers. The clothing of such children particularly the cap should not be given for use to other children. It is advisable to put a paper in the cap before putting it on the head. This paper should be changed daily and the old one should be burnt. The comb, pillow, hair-brush of the diseased child should be kept aside and other healthy children should not be allowed to use them.

Proper treatment should immediately be started on the appearance of the first symptom because at later stages the cure becomes difficult. Accordingly to some medical doctors X-ray is its effective treatment. The effect of the X-ray is that all the hairs fall down and the germs are destroyed when the new hairs grow.

Leg and Thigh Ringworm.

This kind of ringworm generally occurs in toes, between the fingers and in the joint of the thigh. This is also a contagious disease. It is, therefore, not desirable to use the clothes of the person suffering from it. Cotton socks prove beneficial in this disease. Sulphur ointment should be used in the affected part and the other bodily parts should be kept clean. The disease is soon cured by applying some ointment and keeping the various parts clean.

Chin Ringworm.

This disease attacks the roots of the hair in chin. There is inflammation in the affected part and the hairs fall down. The treatment of this kind of ringworm is the same which is prescribed for the skull ringworm. The same precautions and care should be taken in this case also.

Alopecia or Baldness.

This disease affects the hair of head and they fall down. People

wrongly consider it a kind of ringworm. This disease is caused by some defects in the nerves. The hair on the head fall and the affected portion becomes glossy and smooth.

This is not a contagious disease. It is the opinion of some persons that artificial sunlight proves helpful in the disease.

Pediculosis.

The head and sometimes the entire body is filled with louses. It is because of the uncleanness that louses are born. A louse has six feet. The skin of this insect is thick and its claws strong. Louses live in the roots of hairs and thrive on blood. Blood is their only diet. The grown up louse daily lays eight to ten eggs. These eggs stick to hair and are yellowish-white in colour. The germs on the body are like the ones that are on the head. They live in the roots of hairs or in the corners of clothes. Their diet is human blood. They cause restlessness in the body and sometimes one becomes very much restless. Itching, insomnia, restlessness and irritation are some of the symptoms that indicate the presence of louses on the body. It becomes difficult for the child affected by louses to concentrate on studies. He is always found scratching. The presence of louses is harmful, because other infectious and contagious diseases can attack. The person can become anaemic, too, and there is always a fear of being affected by typhoid fever.

Special attention should be paid towards keeping the hair clean in order to get rid of louses. Spray of D. D. T. powder in the hairs kills the louses. After the spray, hairs should be thoroughly cleared so that louses are rooted out along with the dirt that gave birth to them. The solution of Bensoyl Bensonate is also helpful in removing louses. This solution, too, kills louses. Equal quantities of kerosene and coconut oil and hot vinegar applied to hairs kill the louses as well. After applying this mixture, the head should be washed with soap and lethane oil applied on the whole body. The remaining louses are thus killed by this oil. Combining the hairs also removes the louses.

The clothes of the children having louses on their head and body should be boiled in hot water and thoroughly cleaned. They should be ironed when dry. This process kills the louses along with their eggs. Children should regularly be given bath.

Lungs

Although the lungs come direct under the category of respiratory organs even then they may be included in the excretory organs because foul gases are expelled out of the body through lungs. This has already been stated in the chapter dealing with respiratory system.

Bowel

The bowel is also included in the excretory organs of the body because undigested part of the food comes out through it. Besides, the activities of body cells create many useless and harmful things. These things go out of the body through the bowel.

SUMMARY

Kidneys, skin, lungs and bowel are the main excretory organs of the body.

Kidneys. They are two—the right one and the left one. They lie on the back portion on both sides below the last ribs. They are bean like in shape. The ureter originates from the kidneys and urine brought by ureter is collected in the bladder. Urine contains 95.6% of water, 2% uria, 60% salt and 8% other chemicals.

Kidneys purify the blood and throw out the foul matter in the shape of urine.

Skin is of two categories : (1) epidermis and (2) dermis. Epidermis is the protector of the body. There are innumerable pores in it that expell the foul substance out of the body in the shape of sweat.

Dermis is the real skin which keeps the body temperature uniform throughout. In this are also situated nerves, lymphatic capillaries, arteries and veins. There are two kinds of glands in it (1) Sebaceous glands and (2) the sweat glands. The first one, keeps the skin and hairs smooth and glossy. The cells of the other glands absorbs the foul matter of the body.

The following are the common skin diseases :

(1) Impetigo (2) Itch (3) Ringworm (4) Baldness, and Louses
(5) Louses on the head and body.

The bowel expells the undigested part of the food out of the body and the lungs throw out the foul air out of the body.

EXERCISES

1. Explain through a sketch the various activities of the different parts of the skin.
2. Describe the various diseases related to skin.
3. Give a detailed account of the skin diseases that occur in children.
4. Explain the structure and function of kidneys.

Chapter Eight

The Digestive System

When we take food it goes down the stomach through a long tube. This tube is known as the alimentary canal. Starting from the mouth it travels to the rectum. It is 28 or 29 feet in length. Some part of the alimentary canal lies in the neck and the chest. The remaining lies in the stomach. This alimentary canal is wide, thin and narrow at places. This is also called the food passage.

The alimentary canal is divided into the following parts :
(1) Mouth Cavity, (2) Digestive System, (3) Stomach and (4) Intestines.

Mouth Cavity

Mouth cavity is the upper part of the alimentary canal. It is open in the front. Its inner part is covered by a smooth membrane starting from the lips. This part is made of a strong and hard bone. Its name is palate. On its right and left sides are cheeks which are made of soft pieces of flesh. Beyond the cheeks lies the pharynx. On both sides of the pharynx are small lumps of flesh known as tonsils. There are teeth whose main function is to chew food in the upper and lower jaws of the mouth. There is also a tongue in the mouth. It performs two functions. It indicates the taste and carries the food this way or that way when it is being chewed. When after chewing the food becomes pulp-like and ready for being swallowed the tongue helps it to go down the alimentary canal.

The First Stage of Digestion in the Mouth

The real work of the digestion begins with the teeth. When we chew the food with teeth the saliva mixes with it and the food

becomes pulp-like. In this way, it easily goes down in the alimentary canal with the help of the tongue.

Saliva is produced by six glands in the mouth. Three of these are in the right side and three on the left. There is a gland in the cheek just opposite the ear. This gland is called parotid gland. The other is below the ear. The other is below the jaw and is named the sub-maxillary gland. The third lies below the tongue and is known as sublingual gland. The saliva comes from these glands through small tubes and mixes with the food. The food becomes soft and smooth with the help of saliva and easily goes down. Saliva is an alkaline liquid which is thick and sticky and active tissues exist in it. These active tissues are known as ptyalin. It is a kind of ferment which turns the starchy objects like rice, wheat potatoes into sugar. It is because of this that these things give us a sweet taste. This affects only things having alkaline in them. The things with acid in them remain unaffected by ptyalin. It is, therefore, not advisable to eat edibles with acid side by side with wheat and rice. When these objects change into sugar, they reach the blood and get dissolved in it and provide nutrition to the body. In this way, the over produced sugar turns into glycogen and is accumulated in the liver and when needed again turns into sugar. Ptyalin is not present in the saliva of young children. It is due to this reason that young children are unable to digest the starchy food properly.

The food reaches the alimentary canal after being chewed in the mouth. The first part of the alimentary canal is called Oesophagus. This part is made up of muscles. It is flat like a deflated cycle tube. It is inflated when the food enters it and again deflates. The epiglottis does not allow the food to enter the windpipe because it closes the upper part of the larynx. The food in this way straight goes down in the alimentary canal and reaches the stomach. The alimentary canal goes down the neck just behind the windpipe. From here proceeding through the middle portion of the chest it penetrates the diaphragm and goes still down. Finally, it reaches the stomach. The food reaches the stomach through this alimentary canal. In the stomach the alimentary canal takes the shape of sack. This sack is about ten inches in length. There is a hole made by the muscles at the place where alimentary canal joins the stomach. This is known as Cardiac opening. The Cardiac opening changes its size on expansion and relaxation of the muscles. The Broader part of the stomach

called fundus lies beneath the Cardiac opening. The last portion of

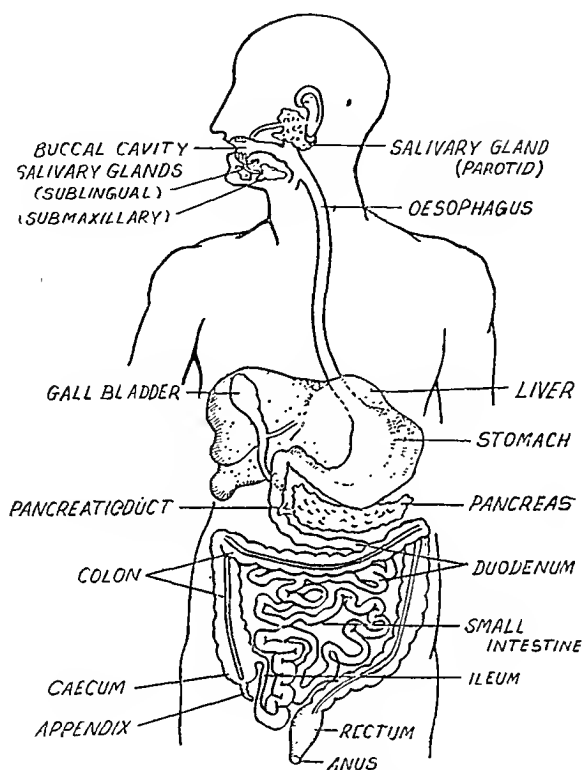


Fig. No. 22 The Digestive System

the stomach is narrow. Here also there is an opening or hole made by muscles which changes size on the expansion and relaxations of muscles. This opening is called pyloric. The expansion power of the stomach is high. When the food is collected in the stomach it expands.

Digestion of Food in Stomach

In the inner part of stomach there is a lining of mucous membrane which has a number of glands in it. A particular type of juice is produced by them. This juice is called the gastric juice. It has got hydrochloric acid and two varieties of yeast called renin and pepsin. The food in the stomach gets digested with the help of these juices. These juices easily digest fish, egg, pulse and meat. Renin curdles the milk. Pepsin turns the protein into peptones. It then turns it into aminoacid and mixes it in the blood for digestion.

Water is necessary for all these chemical actions. The unique feature of renin is that it separates water and coagulates milk. The curdling of milk in the stomach is a natural process and is an indication of the healthy working of the digestive system.

Pepsin affects the protein and separates it into smaller parts. It functions only in the presence of hydrochloric acid. Protein is not fully digested in the stomach. The remaining portion is digested when it reaches in small intestine and then only it becomes fit to be absorbed in the blood.

The starch found in the food remains unaffected by the gastric juice. Sugar and glucose are affected by it and therefore, they change. Fat also remains unaffected by the gastric juice. This is fully digested in the small intestine.

The gastric juice falls in the stomach only when food reaches there or when hunger is felt. The gastric juice is not produced when the mind is in a state of fear because the digestive system at that time does not function properly. It is, therefore, necessary that we should be calm and peaceful at the time of taking food. The gastric juice is capable of killing germs. It kills the germs which reach along with the food.

The digestion periods of different foods vary. Ordinarily it takes four hours to digest food. After the food is fully affected by the gastric juice, the following products remain :

1. Starch turned into sugar,
2. Some unchanged starch,
3. Peptones,
4. Liquid fat,
5. Portion of the food of no use to the body and unfit for digestion,
6. Water, and
7. Salt.

Duodenum

The above parts of the food reach the duodenum in a liquid form. Duodenum starts from the lower part of the stomach. It is a small part of the small intestine and is 12 inches long. It is a narrow tube and is semi-circular in shape like the English letter 'C'. In its lining are chamber-like glands. The gall tube originating from the liver and the pancreas tube join each other in the lower portion of duodenum. The juice coming out of both the tubes mixed with

the food juice and helps in its digestion. In this way, both the organs, the liver and the pancreas have got an important place in the digestive system.

Liver

Liver is the biggest gland of the body which lies in the upper part of the stomach and below the muscle in the middle of sternum. It is reddish brown in colour and weighs about quarter to two kilograms. The liver is divided into two parts by a deep cut. There are five cavities in its lower layer. The gall-bladder which resembles a pear in shape lies in one of these cavities. Coming out of the liver the bile is collected in this bladder and reaches the duodenum according to the need.

The colour of bile is greenish yellow. This is a sticky liquid and tastes bitter. There are minerals and bile pigments in it. The blood, when it enters the liver, has many food tissues in it. The liver takes the excessive part of the sugar from blood and leaves only the necessary quantity in the blood. The sugar creates heat and energy in the body. The liver also supplies the sugar to the body when it falls short of it. The bile coming out of the liver helps in the digestion of food. It has its effect on fat which, as the result of bile-action, is dissolved. The bile also kills the instestinal germs. It also removes the effect of poison on the intestine. The bile returns to the liver when its entering into duodenum is stopped and get mixed with the blood. This causes the dreaded disease of jaundice.

During the action of cells the protein breaks and produced liver uria which mixes up with blood and enters the kidneys. From there it is expelled out of the body through urine.

The Pancreas

The gland called pancreas is below the stomach near the linings of the stomach. It is a long and narrow gland. It is pistol-like in shape. Its broader right part is called the head and the narrow left part called the tail. It is about six or seven inches in length. A number of tube comes out of it and this network is called the pancreatic system.

The juice secreted by this gland is called pancreatic juice. It is thin, clean and sour. It has no colour. Secreting from the pancreatic system it mixes with the juice of gall system (bile) and in this way, juices of both the systems reach the duodenum.

The following things are present in this juice :

1. Amylopsin — It digest the starchy food.
2. Tripsin — It digests the protein.
3. Lipes — It digests the fat. It turns the fat into fatoacid and again into glycerine which reaches the body through blood.
4. Insulin — This insulin keeps the sugar in control and checks the sugar going out of the body with urine. Lack of insulin in the body causes diabets. Therefore, the diabetic person is given insulin injections.

The above descriptions show that the digestion begins with the food reaching the mouth and is almost over when the food reaches the duodenum. The last action is completed by the juice of smaller intestines.

Smaller Intestines

It is muscular tube about 12 feet in length covered with mucous membrane. There are a number of projections in this membrane. They are from 1/48 inch to 1/8 inches in length. There are about 12,000 projections in a square inch of the membrane. A big lymphatic capillary is placed between each projection. This is surrounded by blood capillaries and flesh. The relaxation of flesh caused movement of projection and these generally remain shaking.

In the lining of the lower part of smaller intestines there are groups of a special type of glands. Wounds appear on them during the period of typhoid fever. This condition is also present in the cases of intestinal tuberculosis.

The last part of digestive action is performed by the juice produced in the intestine. The intestinal juice has elements possessing a number of qualities out of which the following three are particularly worth mentioning :

1. **Pancreas exciting element.** This element is called enterokinase. It affects trypsinogen secreted by pancreas due to which trypsinogen turns into active trypsin.
2. **Protein disintegrating element.** This element affects the protein. It disintegrates substances produced by pepsin and dripsine and provides them the simple form.

3. **Sugar changing element.** This element affects the sugar produced from starch and turns it into glucose.

The remaining part of the so far digested food enters the large intestines in a semi-liquid form.

Larger Intestine

This is comparatively broader than the smaller intestine but only five feet in length. There is a door at the junction of smaller intestine and larger intestine in which are fixed valves made by mucous. These valves remain shut so that food may not return to smaller intestines. The beginning part of the larger intestine is like a bladder.

Larger intestine starts from the right region and goes upto the lower part of the liver. After reaching there it turns towards left and is spread upto the spleen. After reaching the spleen it again turns and goes upto the left region. It again turns and enters the pelvic girdle. It ends at the anus. The upper part of the anus is called rectum.

The linings of the larger intestine are also of fleshy fibrous tissues and mucous. But there are no projections in it. In the outer fleshy fibrous tissues there are a number of smaller glands but the glands found in the smaller intestine are not present here. In there linings there are many wrinkles as on a bladder. No particular digestive juice is produced by these glands. The food juice that comes from smaller intestine to larger intestines looses its watery part as it proceeds towards pelvic girdle. This water goes in the blood and plasma. In this way the excreta in the larger intestines dries and goes out of the body through the anus. When the excreta reaches the rectum, the man feels the need of easing himself. At the time of expelling the stool, the anus opens up due to expansion of the muscle and the stool goes out.

Generally, the stool contains the undigested part of the food, spent up tissues, small germs called bacteria and other harmful and waste substances. There is also some part of bile in it. Bacteria produces many harmful things which cause foul odour in the stool. Due to decomposition many gaes, too, are produced. An advanced stage of decomposition of stool produces harmful and poisonus germs. It is, therefore, necessary that stool should pass daily.

Absorption of Food

The digestion of food is one process, while the absorption of

food is another. This process helps the food to be able to supply blood and lymph to the body. The process of food reaching the blood and lymph is called absorption.

Assimilation of Food

When the food changes into soluble matter it, after being absorbed by various organs, mixes in the blood. The process of absorbing food takes place in every part of the canal in a more or less measure. This action takes place more prominently in smaller intestines. While describing the smaller intestines earlier it has been stated that the linings inside the smaller intestines are made up of mucous membrane. There are projections or villi in it. These villi are also surrounded by the layers of cells. In them lie the lymphatic capillaries, nerves and the blood capillaries.

The villi suck a major portion of the digested food. The blood capillaries suck the sugar and the amino-acid while the lymphatic capillaries suck the fat. The cells of the villi are so formed that they take from the intestines the ready elements which are easily absorbed in the blood. After taking these substances they mix it with the blood. They reach every part of the body through arteries from here. The blood capillaries of villi join and take the form of veins. When these veins join, a major vein called the portal vein is formed. This portal vein enters the liver and disintegrates into small blood capillaries. Parts of the food containing starch and protein reach bigger blood capillaries from the liver. Unnecessary part remains in the liver. Here it turns into glycogen and reaches the blood.

While the digested starchy and protein, bearing food flows in the small capillaries of villi the fatty goes in the lacteal capillaries. These lacteal capillaries join to form lymphatic capillaries. In this way the fatty part gradually moving towards the upper part of the body reaches a major vein on the left side of the body near the neck. After reaching this place this part of fat mixes with the blood stream.

The non-digestion of food causes many diseases in the body. Out of these some will be discussed below :

Dyspepsia

The following are the reasons that cause this disease :

1. Continuously taking such food that abounds in fat and carbohydrate causes dyspepsia.

2. Over-eating, too, causes this disease.
3. Bad teeth are also a factor in causing dyspepsia, because the food cannot be chewed properly if the teeth are in a bad condition. The poison from the gums mixes with the food and enters the stomach. In this way, the food not chewed properly and the poison mixed due to bad gums obstructs the smooth functioning of the digestive system causing dyspepsia.

During dyspepsia, a particular type of acid is produced by the undigested part of food which causes stomach-ache. Sometimes vomiting and motions start. Giddiness is also indicative of dyspepsia. There is burning sensation in the stomach and the mouth feels a strange sour taste. Dyspepsia can result in anaemia, headache, dysentery etc. Children suffering from dyspepsia are liable to fall prey to number of diseases.

As a safeguard against this disease, one should regularly take limited food at a fixed hour. Children should particularly be given food that is easily digestible. Large quantities of warm water taken during this disease proves beneficial. It causes vomiting which clears the stomach. Sometimes, laxatives or purgatives, too, prove helpful. By so doing the stool comes out and the intestines become clean.

Diarrhoea

Indigestion also causes diarrhoea. Germ-laden food, half-ripe fruits or the use of bad and dirty water causes this disease. This disease spreads through flies. They carry the germs in their legs and leave them on the food while sitting on it. Eating the food where flies have left germs causes diarrhoea. Sometimes this disease attacks when the stomach catches cold. As a safeguard against this disease one should drink boiled water and protect food from flies by keeping it always covered. Fresh and light food should always be taken. Use of curd may protect one from this disease.

Constipation

Constipation is caused when reasonable quantity of stool does not pass out regularly. The factors causing constipation are more than one. When the food is fried in fat a very small part of it reaches the rectum. As the result of this the urge to excrete is not strong and constipation is caused. Suppressing the desire of passing motion also causes constipation. When due to bad and defective

teeth food is affected with poison and germs reach stomach constipation is the result.

One feels headache, fatigue, lack of hunger, dullness and depression during constipation. Some mild natured poison is likely to be produced in the rectum due to non-passing of the stool. Chronic constipation causes ulcers and appendicitis. These are the diseases of stomach and intestines.

Green and leafy vegetables like spinach, 'bathua', radish, tomatoes, lady-finger, 'parwal' and cauliflower are good for cleaning the bowels. It is very necessary to eat fruits. Sufficient quantity of water should also be taken. These edibles cause excitement of the rectum as the result of which stool passes easily. One should regularly pass stool. The desire to pass stool should never be suppressed. Physical exercises also prove helpful in cleaning the bowels. People take purgatives and laxative in order to remove constipation. These things do give relief at the time, but their effect is not lasting. Too much use of purgatives tells adversely on functions of digestive organs. For lasting and effective cure one should take recourse to the above described measures.

SUMMARY

Alimentary canal has four parts : (1) The mouth cavity, (2) Digestive system, (3) Stomach and (4) Intestines.

The food after entering the mouth proceeds to the stomach, then to duodenum, smaller intestine, larger intestine, rectum, and then passes out as stool through the anus.

The digestion starts with the teeth. Saliva helps the digestion. Saliva is produced by six glands. The stomach is like a bladder in shape. Food is digested here with the help of gastric juices. The food containing protein is not digested here. It is digested in the smaller intestines.

Food passes from duodenum to smaller intestines. Bile and pancreatic juice is produced in the duodenum which also helps in digesting the food. The bile juice digests the fat. The digestive action is almost completed by the juice produced in the smaller intestines. The remaining food in liquid form enters the larger intestines. After reaching here the watery part of the digested food is left behind and the dried up stool goes out of the body through the rectum.

Constipations, dyspepsia and diarrhoea are caused when the food is not properly digested. As a safeguard against these diseases, one should take reasonable quantity of food regularly at a fixed hour. One should also develop the habit of passing the motion regularly.

EXERCISES

1. Describe the digestive organs.
2. Explain in detail with the help of a sketch the changes that appear in the food after entering the mouth and subsequently reaching smaller intestines.
3. Describe the structure of the alimentary canal.
4. Throw light on the structure of intestines and describe their functions in the digestion of food.
5. What diseases are caused by non-digestion of food ? What are their symptoms and how to safeguard against them ?

Chapter Nine

Teeth And Their Diseases

In the preceding chapter it has been said that the food is chewed with teeth. Hence the teeth are important parts of digestive system. The fact is that the teeth play a very important role in keeping the body healthy. Their main function is to chew the food. They make the food easily digestible. The incisor teeth cut the food in small pieces and the grinding teeth chew and turn the food in pulp. Teeth also help in sounds. Our pronunciation becomes faulty in their absence.

Categories of Teeth

According to kind and shape teeth are of various kinds. They may be divided into four categories :

- (1) **Incisor teeth**—These teeth cut the food into small parts. Their are flat and their edges are sharp. With the help of these sharp edges the food is cut into pieces.
- (2) **Canine teeth**—These are long and pointed as compared to incisor teeth. This variety of teeth make hole in the food and tear it asundar. They are, therefore, called canine teeth.
- (3) **Premolars or Bicuspid teeth**—These teeth chew or crush the food. They crush the food with their edges.
- (4) **Molars or Grinding teeth**—The rectangular edged teeth are called molars or grinding teeth. Their edges are sharp. Their function is to grind the food properly. These are very strong. The third or the last tooth of this category is called the wisdom tooth.

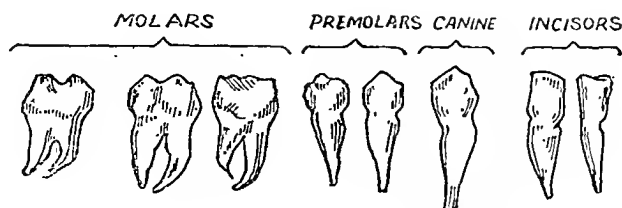


Fig. No. 23 Kinds of Teeth

The teeth can be divided into three parts in view of their structure :

(i) Fang or root, (ii) Neck, (iii) Crown.

Fang or root. The part of the tooth in the cavity of jaw-bones is called the fang or the root of tooth. Incisor and canine teeth have one root, the crushers have two and the grinding teeth have three roots.

Neck. The neck is that part of the tooth which remains in gums.

Crown. The upper and the visible parts of teeth is called the crown of the teeth. It is covered with a particular type of cover. This cover is known as tooth enamel. This enamel is the protector of teeth. It saves the teeth from injuries from harder objects. It differs information with the common bone. This particular element of the tooth named enamel protects the tooth from decaying. Sometimes, cavities appear in it which result in the loss of dentine.

Enamel is hidden on the neck. In the root a cement-like object takes its place. It is yellow in colour and properly fixes the roots of the teeth inside the gums. The inner part of the tooth is made up of a substance called dentine. There is a cavity in the middle of the tooth. This is known as the central cavity of the tooth. It has got a particular type of kernel called the tooth marrow. This is, in fact, the strongest part of the tooth. It possesses blood capillaries, fibrous tissues, cells and minute nerves. This is the live part of the teeth. In it these are nerves which make us feel the comforts and pains in the tooth. The blood capillaries that lie in it provide food to the tooth and carry out the harmful matter. There is pain in this part of the tooth when defects arise in it. (See Fig. No. 24)

Gums. Gums are made up of thick fibrous tissues. On one side these are attached with the teeth neck and on the other with the

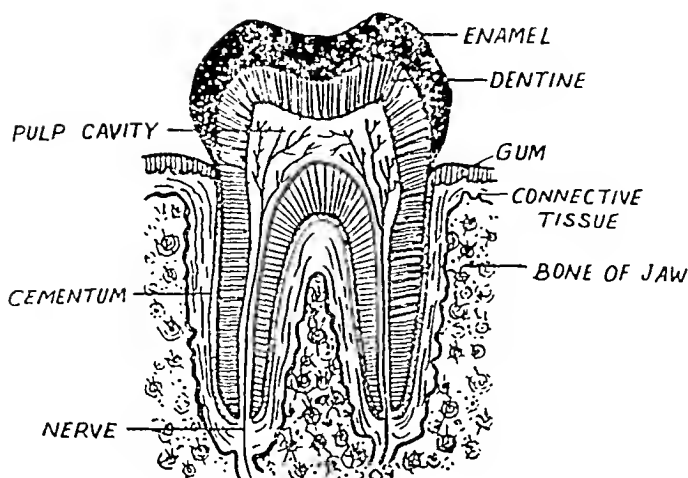


Fig. No. 24 Section of Tooth

jaw-bone. Above the fibrous tissues is a lining of mucous membrane containing blood.

Formation of Teeth

The foundation of teeth is laid during the pre-natal period. When the body is six month old its first teeth begin to show. The process of teeth cutting goes on for a period of two years and twenty teeth come out during this time. The teeth of healthy children are out in this fashion. The cutting of teeth in the weak and unhealthy child is delayed. All the teeth appear in children by the time they attain the age of three years. The first teeth which are cut the lower incisors, then the upper incisors, later on the front premolar is cut. Last to cut are the rear premolars. These teeth are known as the milk teeth and their number is 20 in all. These teeth start falling out from the age of six and in their place are cut the real and permanent teeth. When the permanent teeth are ready for cutting they push the milk teeth and take their place. This process of cutting permanent teeth continues till the boy is of 12 years in age. These permanent teeth are cut early in the case of healthy children. The last four premolars make their appearance in the last. These are called the wisdom teeth. When the mouth is fully developed, the number of teeth too increase and they total in all 32.

The development of teeth thus can be divided into two parts :

- (1) Temporary or Milk Teeth.
- (2) Permanent or Food Teeth.

The number of temporary teeth in each jaw is as under :

(1) Incisors	— 4
(2) Canine	— 2
(3) Molars	— 4
Total	<hr/> — 10×2 = 20 teeth.

The number of permanent teeth in each jaw is as follows :

(1) Incisors	— 4
(2) Canine	— 2
(3) Premolars	— 4
(4) Molars	— 6
Total	<hr/> — 16×2 = 32 teeth.

Common Teeth Diseases

Two teeth diseases are outstanding and need mentioning : (1) Carries or worms in the teeth and (2) Pyorrhoea.

Caries in the Teeth

Like other diseases this, too, is caused by past and present circumstances. The following come under the former :

- (1) Lack of good and nourishing food,
- (2) Heredity,
- (3) Lack of hard foods, and
- (4) General debility.

Lack of Nourishing Food

Calcium, Vitamin 'A' and 'D' and phosphorous are essential to keep the teeth healthy. Their absence affects the teeth. These are equally needed by children, old men and women, mothers and pregnant women. Everyone should get these nourishing things in sufficient quantity.

Teeth will remain in healthy condition if the enamel is healthy. Calcium is needed in an ample quantity in order to make teeth healthy and strong but to digest calcium, properly vitamin 'D' should be present in food in abundance. In its absence the teeth do not get calcium in sufficient quantity. So in order to keep the body supplied with calcium one should take milk, curd, butter, green vegetables, fish, eggs and salads.

The mother's health affects the baby's health too. During pre-

natal stage and infancy, the child gets this entire nourishment from the mother's body. The mother should, therefore, get nourishing diet. Her diet should consist of enough milk, eggs, so that her body may get the needed amount of calcium, phosphorous, vitamins 'A' and 'D', Cod liver and other fish oils remove the deficiency of vitamins 'A' and 'D' to a large extent. Oranges and dried grapes should be taken for procuring vitamin 'C'. These things are necessary to build strong teeth.

For the healthy growth of teeth, mother's milk is very beneficial. During infancy, the animal milk affects adversely the teeth of children. The teeth of those babies who are not fed by their mothers are generally unhealthy and ugly. The mother should at least feed her child with her own milk for a period of six months. It is during this period that teeth are cut and they require nourishing food. The child should, therefore, be given milk, cod liver oil, orange juice and the yolk of the egg. He should be given turnips, carrots, cabbage and cauliflowers when he grows. By taking these things he gets the needed substance for the proper growth of his teeth.

Heredity

Besides the nourishing diet, another factor that affects the teeth is heredity. As other characteristics of a child are affected by heredity, so are the teeth as well.

Not Eating Hard Food

Lack of hard food also affects the strength and growth of teeth. Its lack does not give enough exercise to the gums and jaws, as the result of which the teeth do not get enough nourishing matter. The proper circulation of blood, too, does not take place. For the proper development of teeth, the use of jaws and gums is necessary. Hard food should, therefore, be given to children. They should be provided with carrots, turnips, beet-roots radishes, apples, guavas, papayas, melons and mangoes. Their use not only will give exercise to gums and jaws but clean the teeth as well. The children should develop a taste for these things since the very beginning.

General Debility

General debility has also its ill effect on the children's teeth. During the pre-natal period, mother's bad health affects the milk teeth of the baby. Their teeth become weak. Every kind of indisposition affects the child's teeth. Sound sleep, exercise, fresh air

inhaled through nostrils also prove beneficial in respect of teeth as well.

Other Causes

Besides the above factors there are some other causes for poor teeth. Not cleaning well the mouth after meals, leaves behind starchy matter. Starchy food or sweet if accumulated in the teeth gaps prove very harmful. Bacteria thrive on it. The remnants of these edibles in the mouth produce lactic acid due to the action of bacteria which dissolve the teeth enamel and so the entire enamel is lost. After the destruction of enamel, the germs attack the dentine. Being soft it is easily destroyed. If no care is taken of the teeth the central cavity gets affected and pain is felt in the teeth. The teeth roots become hollow and rotten. Blood capillaries and nerves are then affected and get destroyed. At this time pain is caused in the teeth. The pain automatically disappears when blood capillaries are totally destroyed. The teeth begin to shake in the absence of life in it, because with the loss of blood capillaries necessary nourishment stops. Nerves of the teeth, too, are destroyed. One diseased tooth affects the others and in this way the entire teeth-set is affected. Pus is formed and there is every likelihood of wounds and boils appearing on the gums.

The Result of Diseased Teeth

A man whose teeth are diseased cannot properly chew the food. The stomach, therefore, has to do extra labour in digesting the food. It becomes impossible for the stomach to discharge its function properly and timely. Consequently the food remains in the stomach for a longer period. Under these circumstances, the food begins to rot in the stomach causing the formation of harmful and disease-producing gases. Sometimes there is an attack of colic pain in the stomach. The pus of the teeth mixes in the food and enters the stomach. It gets mixed in the blood and causes many kinds of impurities there. This results into headache and skin diseases. The lymphatic glands in the neck, too, are affected and sometimes these are inflamed. Bad teeth adversely affect the tonsils and the throat also becomes bad. Foul smell comes out of the mouth. People do not like to stand near such persons and maintain distance while talking with them.

Protection of Health of Teeth

The teeth should be thoroughly cleaned before and after taking

meals as a safeguard against teeth worms. Sticky food with generous proportion of carbohydrate and soft food due to remaining in contact with teeth for a long time becomes yeast-like. Pieces of bread, biscuits, potatoes, pastries etc., are food of this type. Their particles enter the teeth gaps and decompose there. Sticky sweets should also be avoided being taken in the night because some of its portion sticks or fills in the gaps and serves as food for the bacterias for the rest of the night. It is very necessary to clean the mouth before going to sleep.

The use of fresh fruits and green vegetables thoroughly cleans the teeth. It also gives exercise to the gums and removes the particles lying in the teeth gaps. Besides, being useful for the body they also prove beneficial to the teeth. The children should, therefore, be made to develop the habit of eating green vegetables and fresh fruits. The children should be given well-cooked bread. This is also useful for the teeth.

For protecting the teeth from germs, food should be properly chewed. This not only proves of help to the digestive function of the stomach but gives exercise to the gums and jaws and provides also enough nourishing matter.

Hard Neem¹ and Babul 'Datuns'² or hard brushes should not be used for cleaning the teeth. This causes scratches on the gums resulting into bleeding. They should, therefore, be avoided. The twigs of Neem, Babul or Maulsri may be used as 'Datuns'. These have germ-killing qualities. Before cleaning the teeth with 'Datuns' its one end should be crushed and formed into a soft brush. The use of soft brushes is also useful. Chewing of green guava leaves and cleaning the teeth with the finger and mustard oil is very useful for the teeth and gums.

While cleaning the teeth, the 'Dahun' should be moved up in the upwards and downwards (*i.e.*, vertical) direction and not sideways or horizontally. In this manner, the particles lying in the gaps get removed. Moving the 'Dahun' or brush sideways or horizontally causes scratches on the gums. Occasionally, the brush should be cleaned in hot water in order to destroy the germs which might

-
1. A kind of Indian tree.
 2. Brush made from the twigs of Neem or Babul or any other tree for cleaning the teeth.

have crept into it. If the food particles are not removed by brush, they should be removed by some harder thing like toothpick. If the food particles are not removed from the gaps it would produce germ and the teeth would consequently get weak.

Some people are of the opinion that the use of tooth-paste of power is useful as a dentifrice. The powder enters the teeth gaps and thoroughly cleans them. The foam produced by tooth-paste, too, has the same action but their effect is not lasting. The fact is that these things do not possess those qualities which are present in such thing as 'Datuns' of Neem, Babul or Maulsri or in the green leaves of guava. These powders or pastes are costly. 'Datuns' and guava leaves have qualities bestowed by nature. Their use gives exercise to the gums and jaws, cleans them and kills the germs. It is, therefore, advisable especially in tropical countries to form the habit of using 'Datuns' and guava leaves for cleaning the teeth as far as possible.

Another thing which proves of use to teeth is the mixture of common salt and mustard oil applied to them. It should be applied like a dentifrice. It must be used at least once a week. The examination of children's teeth by a physician or dentist twice a year is necessary in as much as early detection of defects in the teeth would result in early and proper treatment. Cavity in teeth should immediately be filled.

Irregular and haphazard cutting of teeth needs proper and early treatment. If one tooth cuts on the other it should immediately be removed so that the rest may come up properly. Care of teeth should start from the time the milk or the temporary teeth cut. If neglected in the early stages, it is difficult to correct them later.

Breathing through mouth is harmful. This habit of children should be discouraged. Inhaling air through mouth makes the cold air enter and warm air exit through it. The cold and warm air contacting the teeth at a time tell adversely on the enamel. It develops cracks and the teeth are destroyed. It is also harmful to take cold water just after drinking hot tea. Sudden change in the temperature causes trouble in the teeth. Children should, therefore, be discouraged from doing these harmful things.

The use of very hard thing like betel nut, too, adversely affects the teeth. Their chewing can cause injury to the teeth enamel and thus cause destruction of the teeth.

People are sometimes observed using pins or wooden pricks in

the teeth. This is a dangerous practice and causes gaps between the teeth. The food particles enter these gaps and decompose, causing defects in the teeth.

Pyorrhoea

This is a teeth disease found more commonly in adults than in children. In this disease, bleeding takes place in the gums. Small capillaries are formed near the teeth which serve as living places for bacteria. Foul smell starts coming from the mouth and the teeth become loose.

Pyorrhoea is caused by the following reasons :

(1) uncleanliness of teeth, and (2) unhealthy gums.

Uncleanliness of Teeth.

In the absence of proper cleaning of the teeth, particles of food remain in the teeth gaps which when decomposed cause bacterias. These bacterias weaken the teeth roots. The roots become hollow and more tooth particles begin to accumulate and decompose there. The teeth become loose and the pus formed there becomes the root cause of any diseases.

Unhealthy Gums.

Pyorrhoea is caused when gums become unhealthy and weak. Lack of vitamins 'A' and 'C' make the gums weak and unhealthy. In the absence of the vitamin 'A', their resistance power against diseases diminishes and the lack of vitamin 'C' turns them soft. In these conditions they are attacked by germs and are destroyed.

At the first symptom of this disease, a dentist should be consulted. Cavities should be got filled. Instead of protein dominated food preference should be given to vitamin 'C' dominated food. Gums should be properly massaged. The cleanliness of teeth can cure these diseases.

SUMMARY

Teeth are of four kinds : (1) Incisors, (2) Canine, (3) Premolars or Bicuspids and (4) Molars or grinding teeth. According to structure, the teeth may be divided into three parts. Root or fang, neck and crown. Their development is divided into two parts. Milk teeth or temporary teeth and permanent teeth. Milk teeth are 20 and the permanent ones are 32 in number. Caries and Pyorrhoea.

Cause : lack of nourishing food, heredity, lack of hard food and general indisposition.

Treatment. Regular cleaning is absolutely necessary.

EXERCISES

1. "Health of a man depends on healthy teeth." Comment.
2. Write a short note on the construction of teeth.
3. What do you know about teeth diseases ? How will you prevent them ?
4. How can you keep the teeth clean ?

Chapter Ten

Nervous System, Its Diseases And Mentally Defective Children¹

Nervous System

Nervous system is also known as cerebro-spinal system or marrow fibre system. This is a complicated but well-organised system as compared to other systems, in the body. All other body systems are controlled by this particular system. The nervous system rules over all other systems. The main organ of nervous system is the brain, the king of the body. The brain which lies surrounded by eight bones in a safe place rules the body, controls the functions of all the body organs and goes on receiving information from every nook and corner of the body. Body will remain inactive without brain. In its absence there would neither be blood circulation, nor respiration nor would other parts of the body function.

This system is made up of a particular type of cells. These differ from other common cells. There is a nervous cord called axon. Besides, there are many small fibres which have many branches called dendrites. Jointly, these fibre are called neurons. The colour of nerve cells is light grey. Therefore, these cells are known as grey matter. Their vessels being white are called white matter.

The axons are covered by medullary sheath. The dendrites though joined to the nearest branches of nerve cells are not attached to each other. These places are known as synaptic junctions. Each

1. Taken from Author's "Modern Psychology in the New Education", Chapter 3, Ram Prasad & Sons, Agra.

activity of the body is felt through the action of this system. Nervous feelings are transmitted by dendrites like the electric current from one nervous cell to another. Their feeling power is so sensitive that we have no idea of the time although activities continuously take place. A network of such axons and dendrites are spread all over the body which carry the feeling instantly to the spinal cord. The feelings of repeated actions are each time conveyed by the synaptic junctions to spinal cord or brain. Repetition of action reduces the power of synaptic junctions as the result of which each time the action is repeated, transmission of feeling becomes easier and faster. It is due to this reason that repeated practice of work makes it easier. Lessons repeated many times become simple and easier to remember because of this action. Sometimes, the feeling transmission power becomes dull. This is due to tiredness of synaptic junction on account of overwork. Alcoholic drinks and other narcotic drugs also occasionally make it dull.

Main Parts of Nervous System

Nervous system is made of two different but interrelated systems :

- (a) Central or Cerebro-Spinal System.
- (b) Peripheral Nervous System.

Central or Cerebro-spinal System is divided into two parts :
(1) The safely placed upper part in the skull (brain), (2) The safe smooth, long and circular part in the vertebral column (Medulla oblongata).

Brain

The brain is not only an important part of this system but is also the most important part of the body. It is oval in shape and its front portion is comparatively narrow but thick. The weight of a young man's brain is $1/50$ of the total body weight. The weight of a man's brain in the age group of 15 to 49 years is about 1300 grams and that of a woman in the same age group is approximately 1100 grams.

The nature has kept the brain inside the membranes to keep it particularly safe. The membranes are (1) Duramater, (2) Arachnoid, and (3) Piamater.

Duramater is thick and stron. It is placed below the skull bones. It protects the brain like a soldier. After this comes the

archnoid which is thin and soft. The membrane placed still below is called *pia mater*. It is very thin and attached to the brain. A network of blood vessels is spread in it. Besides, there are a number of projections and cavities in the brain. Projections are called *convolutions* and cavities are named *fissures*. *Pia mater* also penetrates *fissures*, as it is attached with the brain.

The brain is divided into four parts : (i) *Cerebrum*, (ii) *Cerebellum*, (iii) *Pons Variolæ* and (iv) *Medulla Oblongata*.

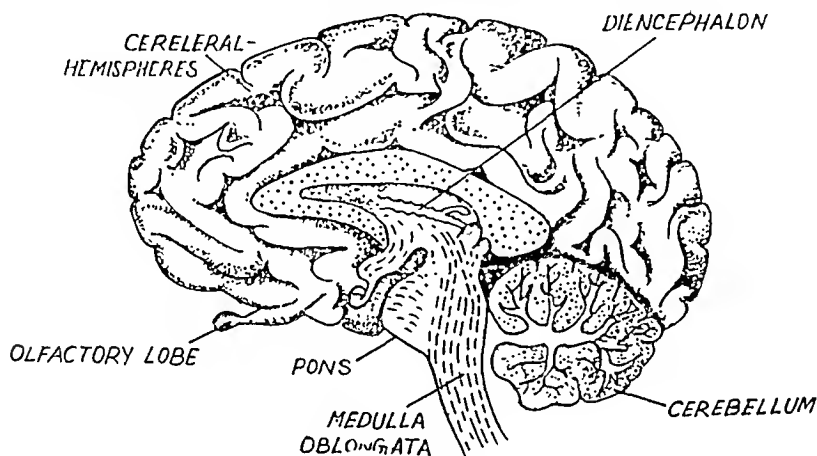


Fig. No. 25 The Brain (Longitudinal Section)

Cerebrum

This is the biggest part of the brain. The fissure divides it into two parts. These parts are called *hemispheres*. One is called the right and the other the left hemisphere. These two are separated by a longitudinal cerebral, but in the lower part they remain joined by marrow tissues. This joining bond is called *corpus collosum*.

There are a number of *fissures* and *convolutions*. These are like furrows in a field. *Fissures* divide the brain into many parts. Each part is called *centre*. These have definite functions assigned to them. They are named after the nature of their functions, *e.g.*, taste centre, hearing centre, smelling centre, seeing centre etc. The depth of *fissures* is related to human intelligence. Intelligent man's *fissures* are deeper but they are shallower in the case of *mediocres*.

Cerebrum is full of grey and white matter. Grey matter covers the white matter. Grey matter is called *cortex*. It is made up of nervous cells and nervous fibres. The nervous fibres enter the cor-

tex. The cortex of an intelligent man is comparatively thicker than that of a mediocre's.

Structure of Cerebrum

The grey matter is made up of various kinds of marrow nerves. There are about 300 crores of cells in the brain. Some of these cells are needle-shaped. Their middle portion is made up of life-juice. The core is in their centre. Arms come out on all sides of this core. In addition, a long wire comes out of each cell. The white matter is generally made of them. These wires go from one part of the cerebrum to another, from one hemisphere to another and to cerebellum, medulla oblongata and vertebral column. Each marrow fibre is independent. Their arms, too, are independent. Although their branches are intermingled, yet these are not related to each other. The marrow cell with all its arms is known as neuron.

The needle-shaped cells are of many varieties, Some are small, some of middle size and many are huge-sized. There is one more variety of cell which lies in the nerve cell and helps it.

The white matter is a group of marrow tissues. It comes out of the marrow cell of grey matter from medulla oblongata and other parts of the brain.

Functions of Cerebrum

Its functions are varied and complicated. These functions are related to thinking, remembering, desire, will-power, feeling, execution of works etc. This is the centre of intelligence and knowledge. On its strength we think, take decisions, learn, understand and remember. In this part of the brain emotions like love, hate, fear, joy, sorrow and anger are produced. Each of these functions are entrusted to different parts.

It has been proved by experiments that if a man's brain is damaged, he will have no initiative to execute a work on his own. He will get the stimulus for external activities through medulla oblongata. He will move his limbs but will not feel inspired to do anything voluntarily. Such actions are called relaxations.

Injury to the cerebrum causes unconsciousness but the man regains consciousness after treatment. Emotions are born again. This shows clearly that every action of the body is controlled by cerebrum. Defects in cerebrum destroy the intellectual power of

the man. Narcotic drugs affect this vital part and men using alcoholic drinks and other narcotic drugs lose their intelligence and sometimes the addicts turn insane.

Those children whose cerebrum is comparatively smaller in size are mentally weak. Intelligent children have larger cerebrums.

Cerebellum

A small nerve centre in the rear and lower part of cerebrum is called cerebellum. It is like a flat ball in shape and is about four to five ounces in weight. The cerebellum is divided into two parts. Like the cerebrum, this too, is grey in the upper part and white in the lower part, and has convolutions and fissures. The fissures in cerebellum are less wider but deeper in comparison to cerebrum. Brain's pia mater goes to a large extent in the cerebellum.

If the cerebellum is cut into two parts, the parts would look like a tree. There are cells in large numbers in the grey matter. The white matter is made up of wires that come out from the cells of grey matter. Nerve fibres go from cerebellum to cerebrum and medulla oblongata. Similarly, the nerve fibres also come from these parts to cerebellum.

Functions of Cerebellum

Cerebellum controls the actions of muscles. Movements of limbs like, walking and running are controlled by it. Defects in cerebellum put an end to these activities of the human body. The man can neither run, nor walk, nor can perform such functions which need the combined efforts of many muscles. Cerebellum orders some muscles to relax and others not to do so. When these two orders of the cerebellum are carried out properly by the muscles, the smooth movements of limbs take place. The movement of body limbs is the responsibility of cerebellum. The right part of cerebellum assists the left part of cerebrum while the left part of cerebellum in the same way assists the right of cerebrum. Thus, the functions of cerebellum is to maintain uniform movement of the body parts.

Pons Varole

It is a dam, like the nerves fibres bridge which originates from above the medulla oblongata and joins both the parts of cerebellum. It also joins the medulla oblongata with cerebrum. All the nerves' fibres originating from cerebrum pass through it. These nerve fibres

pass over each other in such a way that those originating from right hemisphere of cerebrum pass through fibre bridge on the left side and reach the muscles in the left portion of the body. In the same way, those fibres originating from the left hemisphere go to the body. Because of this set up an injury caused to the cerebrum's right hemisphere stops the functioning of the left part of the body and injury to left hemisphere results in the stoppage of the functions of right body part. In front of the Pons Variole there is a disc-like gland which is called pituitary gland. It plays an important role in the mental and physical development.

Medulla Oblongata

Medulla oblongata is that part of the brain which is situated behind the pons variole and the lower part of cerebrum. It is a cylinder-like gland made up of marrow tissues and is connected in the upper part which cerebrum and through the lower part to cerebellum. Spinal cord starts from its lower part. Contrary to other brain parts, the white matters remain above the grey matter in the medulla oblongata. Medulla oblongata is very thick and broad near the pons variole but is narrow near the foramen magnum. It is about a quarter of an inch in length. All the tissues going from spinal cord to brain pass through it. In its middle are situated the blood circulatory, respiratory digestive and other centres. The medulla oblongata is, therefore, an important part of the brain. The life depends on it. Injury to it causes instant death. Of the twelve pairs of tube originating from the brain six come out in front of the medulla oblongata and the rest come out from the rear.

Spinal cord is like a rope made of nervous tissues. It starts from the foramen magnum. It is about 18 inches long in males and about 17 1/2 inches in the females. It is also covered with a layer of three membranes. There is a crevice in the front portion and another in the rear portion. These crevices are so deep that they join each other. Between them is a very narrow passage through which passes the central canal. Like the brain it, too, is made up of grey one. There are cells in the grey matter and fibres in the white matter.

If the spinal cord is cut vertically and examined we will find the grey matter in the shape of the English letter 'H'. Its both arms are slightly curved. One arm is in the front and one in the rear of spinal cord. The front arm is called the anterior and the rear one the posterior nerve root.

The formation of spinal cord grey matter is like that of the brain. This is also made up of marrow cells and fibres coming out of them. Spinal cord white matter is made up of matter that is covered by fibres. These fibres come and go to each part of the brain. In this way, these carry instructions to all the parts of the body. The fibres of the right part of the body reach the left part of the brain while those of the left part go to the right part of the brain. These control the movement of muscles. Therefore, if the root of any of these fibres get out, the movement of the muscles connected with that fibre, stops. These can experience feeling and touch. These conductor nerves start from the anterior nerve root and later are connected with the posterior nerve root. Their fibres bring sensations experienced by touch from the skin that covers the various parts of the body. This is why these are called feeling roots.

A man does not feel any sensation or pain or other things in the part where these fibres become defective but the connected muscle continue to operate and move. Thus, it is evident that each nerve of spinal cord is related to the feeling and speed.

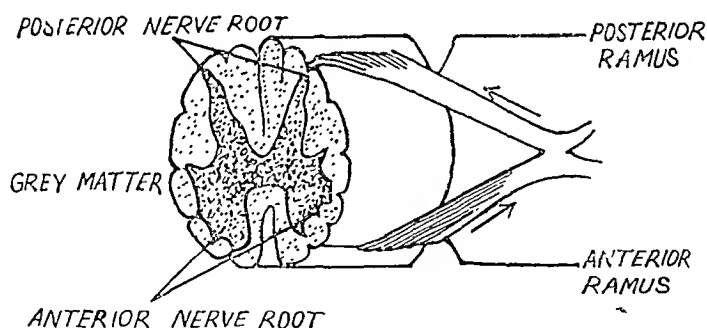


Fig. No. 26 Functions of Spinal Cord

Functions of the Spinal Cord

The nerve fibres that constitute the white matter of spinal cord and the nerve centres situated in the grey matter has important functions to perform. The white matter has that transmission and receiving power that enables the brain to transmit and receive information from each part of the body. The actions and feeling of the right body part are communicated to the left portion of the brain and those of the left body part are received in the right portion of the brain. The same arrangement exists in the brain for giving instructions to the left and right part of the body. Illness or injury

to the spinal cord puts a stop to the transmission and reception of instructions. We can neither move our body part nor feel the pleasures or sorrows, if the spinal cord is affected by illness or injury. If the spinal cord near the neck is affected by injury or disease paralysis will be caused, although the man may not die, but if the inner part of the spinal cord in the neck is affected, it will result in instantaneous death, because from this spot starts nerve fibre and go to the diaphragm muscle. These control and guide the movement of body parts. Since the diaphragm is related to the respiratory function of the body, it will not be possible to breathe in the case of the above described injury to the spinal cord resulting in the death of man.

The grey matter of the spinal cord is also not less important. The neuron which makes the grey matter is related to the movement of those muscles in which reach the transmission fibres of the front roots of the spinal cord nerves. Voluntary movements are not caused in the grey matter of the spinal cord like the grey matter of brain. If the spinal cord is injured or diseased at a particular spot, the actions of the muscles of the body part below it which are controlled and directed by the front roots of the nerves will not be possible according to desire. The movement of these parts below the injured spot will not react to desires. And how can it be possible when their connection with the brain is cut off? If these parts are goaded some movement will take place, but the brain will not play any role in it. In such conditions, the sensory wires get instructions from the spinal cord and then some movement is caused without the help of the brain. These movements are called reflex actions. These take place due to external factors without our knowing them. The brain plays no part in these movements. Such movements are conducted by the small centres situated in the grey matter. The contraction of the retina when we enter into light from darkness or its expansion when we go from light into darkness is an important example of reflex action. These take place automatically. One does not feel them. During this reflex action the spinal cord acts like a subordinate officer who issues order in the absence of the higher officer and communicates it to him. This order remains in force if the higher officer approves of it, but if he disapproves of it, he cancels it and issues a fresh order in its place. The main aim of the reflex actions is to protect the body.

Peripheral Nervous System

A periphery is made up of very thin nerve fibres coming out

of neuron. Nerve fibres are attached and properly tied up with each other by the ligaments. According to functions, these are divided into two categories : (1) Afferent, (2) Efferent.

The afferent nerve fibres carry information to the brain or spinal cord and the efferent nerve fibres bring instructions from the brain and give them to muscles, glands or blood vessels. We experience through afferent nerve fibres the feelings and impulses produced by the touch, smell or other actions. It is because of this nature of their function that these are also called sensory nerves. The efferent nerve fibres inspire movements of the muscles. These are, therefore, called motor nerves. If due to the inspiration of certain motor nerve, a gland secretes, that particular type of nerve is then named secretory nerve. The nerve which broadens or narrows a blood vessel is known as vaso motor.

Brain Peripheries

Twelve pairs of peripheries originate from the lower part of the brain. These are called skull peripheries. These are particularly related to sense organs such as, olfactory nerve, auditory nerve, gustatory nerve, optic nerve and neck etc. Some of these peripheries are sensory and some are motor.

- (i) **Olfactory Nerve.** This nerve is related to smell. The olfactory nerve starts from the mucous membrane of the nose and it enters the brain and joins the olfactory centre.
- (ii) **Optic nerve.** This nerve is spread over the optic lobes. These are attached with each other near the pituitary gland in the lower part of the brain.
- (iii) **Oculomotor nerve.** It is purely a motor nerve. It is related to the muscles which turn the optic lobes in various directions.
- (iv) **Oculomotor.** This is also an optic motor nerve but this is related with the movement of the eye.
- (v) There is one more nerve related to the movement of the eyes.
- (vi) **Trigeminal nerve.** Trigeminal nerve is the biggest nerve of the brain. This is divided in three branches and is, therefore, called trigeminal nerve. One of its branches which spreads over optic lobe, nostrils, mouth, teeth, cheek and

tongue is called sensory nerve. All actions and messages reach the brain through it. Out of the remaining two branches, one goes to the upper jaw muscle while the other to the lower jaw muscle as the result of which the jaws move while we take food.

- (vii) **Facial nerve.** This nerve controls the movements of facial muscles.
- (viii) **Auditory nerve.** It is related to hearing. It goes to the ear drum.
- (ix) **Glosso pharyngeal nerve.** This nerve is divided into two parts, one of which spreads in the hind part of the tongue. We feel the taste of the food through it. The other branch goes upto throat and helps in swallowing the food. This is also called the tongue and throat nerve.
- (x) **Vagus of pneumo-gastric nerve.** This nerve is related to lungs, liver and stomach. Its area of action is widespread. It is, therefore, called distributory nerve as well.
- (xi) **Spinal nerve.** This is a motor nerve going to particular muscles of chin.
- (xii) **Lower tongue nerve.** It is called the lower tongue nerve because it lies in the lower part of the tongue. It controls the actions of the tongue muscles.

Nerves Starting From Spinal Cord

Thirty-one pairs of nerves start from the spinal cord with spacing. Eight in the neck, twelve in the sternum, five in waist, five in liver and the rest in other regions. Each nerve is joined with the spinal cord by two parts. The front part is called ventral root and the back part the dorsal root. Both the roots join each other near the spinal cord. These joined roots make the nerve.

All the spinal cord nerves are mixed nerves. Each nerve has two fibres out of which one is sensory fibre and the other one is motor. The sensory fibres come from the different parts of the body, join the spinal cord and convey messages. Through them the spinal cord feels the impulses and senses of the different parts of the body. These fibres are, therefore, called sensory fibres. The other fibres come from the inner part of the spinal cord, go to different body parts and create movement in them. These are, therefore, called motors.

Sympathetic Nervous System

Every nerve of the spinal cord is related to sympathetic nervous system. On both the sides of dorsel are two strings. There are projection-like ganglias on both of these strings at some interval.

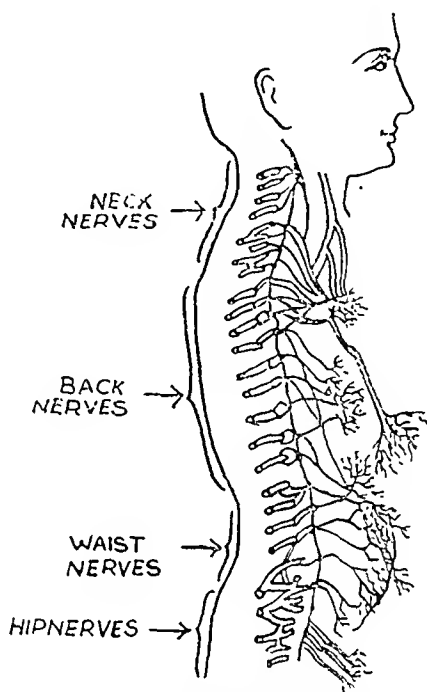


Fig. No. 27 Sympathetic Nervous System

These ganglias are yellow in colour. This is why this nervous system is also called yellow nervous system. The nerves coming out of this system are called yellow nerves. A number of branches come out of these ganglias. Some of these join the branches of the nerves coming out of the spinal cord and some join the blood vessels of the inner body part. The movement of inner parts are caused by this system. This system controls and directs the body actions during emotional activities like fear, grief, impulses, hate, love, comfort. For example, when the man is terrified, his face turns yellow. During the fear emotion the fibres of this nervous system are affected causing less flow of blood. Consequently, the face turns yellow in the absence of blood. Similarly, during joy, the face turns red, and one does not feel hunger during grief.

Special Nerve Centres and Their Development

The centres relating to blood circulation and perspiration etc.,

are fully developed in the child at birth. These are independent centres. Brain has no control over them. Other centres develop gradually. They by and by gain strength and control. As the time passes, the external factors change and there come changes in reactions as well. The control centres develop first. Then develop the afferent centres which provide strength to see bright objects and listen to loud tones. Gradually, the child begins to recognise the different between various lights and sounds. These centres do not develop separately. These are interrelated. With the development of each centre also develop the fibres which keep contact with other centres. In this way is established a relation between the sound-producing object and its sound and colour, shape and size. It is due to this that the child as soon as it hears a sound, the picture of the sound-producing object is drawn in his brain with the result that the child soon learns to establish relations of words with the objects and feelings.

This development takes place properly in a healthy child. The following factors which influence the blood circulation also affect the development of brain :

1. Weakness and indisposition.
2. Alcoholic drinks and other narcotic drugs.
3. Lack of fresh air, sufficient light, reasonably nourishing food, exercise, sleep etc.
4. Defective functioning of ductless glands. Besides the above, heredity also affects the mental development to a large extent.

The following special nerve centres are worth mentioning :

1. The auditory word centre.
2. The visual word centre.
3. The writing speech centre.
4. The writing centre.

The auditory word centre lies in the left part of the brain. The development of this centre takes place when the child starts to recognise and understand the words.

The visual word centre is a special part of optic centre and is related to the movement concerning the recognition by the child of the shadow of words. This centre develops when the child starts learning the letter.

The centre which controls the movement of lips and tongue is called the motor speech centre. It develops when the child starts speaking.

With the development of the visual word centre, the writing centre also develops. This centre is a special part of the centre that controls the muscles of the right hand. The last two centre's development takes place later as compared to the earlier ones. These centres are also interrelated like the other centres. Because of this interrelationship the man can write the heard or seen letters and can read them also. All the above four centres are related to the brain.

Word Deafness.

It is necessary for the teacher to have a proper knowledge regarding the development of the above centres. The auditory centres of some children are not fully developed. They, therefore, fail to distinguish between the sounds of some letters. This state of affairs called the word deafness. It is because of this factor that a child turns a mediocre.

Word Blindness.

Word blindness is caused when the visual word centre does not develop properly. The child as the result of blindness fails to recognise the sound of the written letter.

Categories of Mentally Defective Children

The following are the categories of children having defects :

- (i) Backward child, (ii) Dull child, (iii) Feeble-minded child, (iv) Imbecile child, (v) Idiot child, (vi) Morally defective child.

Backward Child and His Care

Generally, people fail to distinguish between a backward and a dull child and think that there is no difference between the two kinds, but a difference does exist. Backward children are those who have a normal brain but for certain reasons do not progress like other children of the school and remain backward.

In a backward child, although the number of nerve cells and fibres remain normal, yet they do not develop to the extent they ought to. Lack of full development causes indisposition and educational backwardness. Sometimes, the child remains backward in the class due to defects in hearing and seeing. Dumbness is also the cause of this educational backwardness. Lack of nourishing and balanced diet also tells adversely on the full development of brain. Rickets

and tonsils also give rise to mental defects. Adenoids cause deafness in a child. The respiration, too, becomes defective. As a result of these, the child becomes indisposed and backward. Lack of sound sleep is another factor contributing to backwardness. Other reasons that create backwardness are continuously changing the institution, late admission in the school and absence for a considerable period from school either due to illness or other reasons.

The backwardness caused by the above factors may be removed if the contributory factors are removed. The eyes, ears, nose and throat of the child should be got examined by doctors. Even slight defects should be carefully treated. Nourishing and balanced food should be given to the child. The children suffering from eye or ear defects should be sent to institutions of the blind, deaf and dumb.

Dull Child

The dull children are those who are inferior in intelligence to children with normal brain but are better off than the feeble-minded children.

The cause for dull intelligence is the shortage of nerve cells relating to higher intellectual activities in the body. As the result of this shortage, the mental development is slow and the child lacks in efficiency and character. The child is not capable of learning any subject. Generally, this defect is born with the child and it is difficult to get rid of it. The intelligence quotient of such children is between 70 and 85 as compared to a normal child, *i. e.* their I. Q. is 15 to 30 less than that of a normal child.

Symptoms of a Dull Child and His Care

Such children start speaking and walking late. Their teeth also cut late. Their face gives a lethargic and dull expression. They walk lazily. They lack concentration and reasoning power. Their habits are dirty and every actions is slow.

Particular attention should be paid towards the studies of such dull children. The moment suspicion arises about the dullness of a child, he should immediately be shown to a doctor. Children with extremely dull mind are not suitable for ordinary schools. Their education should be arranged separately. They should be imparted some practical, and vocational training with a definite purpose. Their education should be so patterned that more physical work is in-

volved in it. For example, they should do gardening, carpentry, leather work, book-binding, tailoring, weaving of blankets and durries etc. For the girls of this category, arrangement should be made for learning tailoring, weaving, cooking, washing etc. They should be given more opportunity for physical exercises, sports and dance etc. Scouting and girl guide training is also useful. They should be asked to clean the house, wash clothes, polish shoes and other household work in order to create in them the feeling of responsibility.

Special educational institutions should be opened for such students where fresh air and sunshine are in abundance. There should also be big fields where they may play freely. Classes should be small and there should not be more than 20 students in a class. Personal attention of the teacher is necessary in the case of children with dull mind. The lesser the number of children in a class the more attention the teacher will be able to pay. Arrangements for mid-day meals should also exist for such children.

Children with Mental Deformities

Except the backward and dull children, the remaining four categories belong to those children who suffer from some mental defect. Defects in the brain are caused when the brain has not fully developed or something has retarded its development. Heredity is one of the main reasons. Heredity is the cause of mental defect in about 25 percent of children with mental defects. A scrutiny of their family history would reveal that their parents suffered from diseases like, epilepsy, hysteria, syphilis etc. Their mind too, was weak. Children born with mental defects have a lesser number of cells as compared to a normal child and their brain too, is not properly developed.

Besides heredity, this defect may also be caused by any of the following reasons :

- (a) An injury caused to the brain during the pre-natal or inter-natal period.
- (b) Less secretion by thyroid glands.
- (c) Defects since birth in sensory organs like eye, ear, nose etc., retard the development of brain cells. Consequently, the brain is not fully developed and defects arise in it.
- (d) Inflammation in brain nerves during childhood. Excessive sleeping also cause defects in the brain cells.

I should be properly understood that treatment of this defect is possible in special circumstances only. Ordinarily, it is not possible to remove these defects. Such children may be divided into four categories according to the defects.

Feeble-minded Child

This category of defect is either since birth or since childhood but it does not come in the category of idiocy. Such persons depend on others for their protection but they should not be entrusted with either their own or other person's safety. Arrangements for their education should be made in special institutions. They are incapable of learning in ordinary schools. The mental age of such children is generally three years below that of an average child.

Imbecile

Such children are either born with this defect or develop it during childhood. The mental defect in this category of children does not reach the idiocy stage. These children cannot look after their own safety. They are not capable of learning, reading and writing.

Idiots

This is the lowest category of children with mental defects. They are completely unfit for education. They even cannot express themselves through speaking. Their mental derangement reaches a stage where they cannot even protect themselves against ordinary physical dangers.

Morally Defective Children

Such children have weak moral character since childhood. Criminal tendencies develop in them. Lying, theft or violating law becomes an ordinary thing for them. Punishment has no effect on them.

Symptoms in Children with Mental Defects

The symptoms may be divided in two categories :

(1) Mental symptoms, and (2) Physical symptoms.

Mental Symptoms.

(1) The will and thinking power of such children lack determination.

(2) Their memory is weak because of the lack of concentration. Such children develop mechanical memory by doing a work

repeatedly, but if there is a slight change in the routine their memory fails them.

(3) The mentally retarded child cannot discuss a subject and support it on the basis of reasons. He is neither able to establish relationship between two objects on the basis of reason nor can he put to action what he has learnt. For example, if he knows mathematical tables he will not be able to use them in additions and subtractions.

(4) Such children, cannot of their own accord, concentrate on a problem for a considerable period. Their concentration power is weak. They have blank looks.

(5) The power of establishing relationship between two objects is lacking in these children. Their imagination and reasoning power is weak.

(6) The speaking of these children is also defective, because they start speaking at a late stage.

(7) Their imitating power is generally very strong. They learn through imitation.

Physical Symptoms.

The teeth of children of this category cut late. They start speaking and walking late. Their excretory organs are also not fully under control.

(1) Their facial expression and physical movement are lethargic. They also appear to be unable to control their muscles.

(2) The development of such children is retarded. So the development also does not take place properly and systematically. Such children are generally short-statured. Their blood circulation too does not function properly.

(3) The shape of the ears of these children is uncommon. They have more hairs on their fingers and toes. Their skin is dry, thick and rough.

Education of Mentally Retarded Children

The teachers should find out such children in the class and the school doctor's attention should be drawn towards them. If the doctor finds them mentally defective they should be transferred to special schools. In these schools attention should mostly be concentrated in developing their mental faculties.

These special institutions should be located in spacious places

where open air and sunshine are available in abundance and there is enough land for gardening and other things. A class should not contain more than 25 students. Physical training, vocational training, sports, hygiene etc., are the subjects the education in which may be of more help to them. Being mentally below par these children should not be given intellectual education directly. In special conditions, they should be taught reading, writing and speaking correctly. Simple arithmetic, painting, natural science and music are some of the subjects that can be taught to them. Gardening, leather work, tailoring, cooking, carpentry, etc., may be taught to them. They should be encouraged to do such work may arouse interest in them and develop their mental faculties.

Sensory training will prove more beneficial to them. Models, charts, toys and machines, etc., are good mediums for training them. Montessori toys, constructive sports, designing on bed-sheets and paper work are some of the mediums of their education in the early stage. Later on, the children should be taught leather work, tailoring and card-board works. Further, they should be given training in carpentry, tool repairing and making of metal wires. Such practical training will afford opportunity for full development of the sensory organs.

Social education is also important for them. They should be taught manners, cleanliness, virtuous living and protection of others' properties. Opportunities should be afforded to them so that sense of responsibility, duty and doing good to others may arise in them. They should be encouraged to participate in organisations like girl guide and scouts.

Treatment of Mentally Retarded Children

At the slightest suspicion of mental defects in a child, the first thing to do is to get him mentally and physically examined. The parents should always be present during the medical check, up so that they may be readily available to supply all detailed and relevant informations the physician might need. Such children should be taken from the common schools and admitted into special ones. It is also good to send these children to the places of treatment. If it is, however, felt that their proper care is needed in the house, the home atmosphere should then be made congenial. Doctors should always be consulted about the child's progress and conditions.

Steps to Check the Number of Mentally Diseased Persons

To check the growth of mentally deranged persons, it is desi-

rable to that their marriages should be banned. They should be sterilised and should be placed in mental asylums.

Diseases of Nervous System Chorea or St. Vitus' Dance

This is a dangerous nerve disease. There is a possibility of the patient becoming a victim of heart disease too. The attack of this disease generally occurs between the age of seven and fourteen years. Sometimes, whooping cough, scarlet fever, high fever, fear, excessive worry and too much of work cause this diseases.

At the initial stage, the child appears lazy. His face is deformed. The actions of his muscles suddenly become irregular and aimless. This disease can easily be diagnosed from tongue. The children, suffering from it cannot keep their tongue steady if once they take it out. The tongue appears shivering and the child loses control over it.

Different body parts show different symptoms. The attack of this disease on face causes the muscles go out of child's control. The muscles of lips, cheeks, eyes and nose shiver continuously in a manner that gives the child the appearance of a naughty boy making faces. The speech is also affected. If the hand is affected, it continues to shiver. Consequently, it is not possible to hold things in the hand and these always fall down. Continuous contraction of hand muscles produce only one kind of movement which is aimless, as the result of which the writing becomes bad. As the disease develop, the restlessness in the child, too, develops. His concentration power becomes weak. He feels headache and becomes short-tempered.

The child suffering from this disease should be given full rest and allowed to go to school only when he recovers. If the child stops taking rest while some symptoms of disease remain, there is always a possibility of the disease relapsing and grave situation may arise. Doctor's supervision is essential till his absolute recovery. Proper medical treatment should be provided to the child and he should remain in health surroundings. He should be given nourishing diet at regular intervals, suitable clothes, sufficient rest as well as regular exercise. Particular attention should be paid in keeping the child clean. Sufficient improvement will take place if the child is looked after in the above manner.

Stammering

Stammering causes defective pronunciation. This defect is

cause by various irregularities of the muscles that control speaking. When the child while speaking pays undue attention to the muscles concerning mouth, tongue, lips, etc., and less attention to respiration then more energy is lost on muscles not relating to speech than on other. Consequently, pronunciation becomes defective and obstructions in speech are caused. Stammering is divided into two categories :

- (a) **Initial Stammering.** This causes trouble in pronouncing the first word.
- (b) **Stuttering.** In this repeated obstructions appear either in the beginning of the speech or in the middle whenever consonants are spoken.

The defect is caused by the following :

- (1) Tonsillitis or Adenoids.
- (2) Sudden accidents.
- (3) Serious illness.
- (4) Imitation.
- (5) Perturbation.
- (6) Unusual excitement.
- (7) Hesitation.
- (8) Emotion.
- (9) Worry or troubles.
- (10) Hereditary nerve disease.

It is essential to pay attention to the mental state of the child for removing this defect. The child should be made free from worry, hesitation and perturbation. Enlarged tonsils should be operated upon. Nourishing and balanced diet should be given to the child. They should not be asked to labour hard and rest should be provided to them. The services of a child psychologist should be utilised for the proper care of children suffering from the above defects. He should be admitted in a class where there are only ten or twelve students. The personality of the teacher has an important place in the treatment of children. The feeling of self-confidence should be aroused in such children. They should be asked to give exercise to their tongue, lips and respiratory organs. The co-operation of parents is necessary for speedy improvement. Children should be made to practise in the home what they learn in school. The teacher and parents should see that the child should speak slowly and inhale enough air in lungs with each word.

Hysteria

Mental irregularities cause hysteria. The fit is caused when the patient tries to attract other's attention or is filled with a particular emotion. There is no change visible in the body during this fit. Girls suffer more from this disease. The girls with unbalanced emotions suffer more from this disease during adolescence.

During the fit the patient either cries or laughs or indulges in other exciting actions. Afterwards he heaves a sigh, falls down and turns unconscious. The face of the patient does not turn yellow during the state of unconsciousness. The pulse also remains regular. His or her consciousness is not lost fully. It is due to this that while falling, the patient manages to escape injuries.

The patient should not be shown any sympathy during the fit. After preparing the parents' history he should be advised psychological treatment. Cold water should be sprinkled over the face. The patient becomes all right when left alone.

Epilepsy

Disorder in the nervous system is the cause of epilepsy. The disease is divided into two categories—(1) Major epilepsy, and (2) minor epilepsy. In the major epilepsy the body contracts besides occurring of unconsciousness. The patient appears lethargic and restless before the attack. His face turns yellow. Sometimes, no symptoms appear beforehand and the child all of a sudden cries and becomes unconscious. During the fit, all the muscles contract and the body becomes stiff. The patient contracts his body during the first two or three minutes and begins to throw his hands and feet hastily. The mouth throws foam. He also urinates during the fit. The eyes move in a corner. When the contraction stops, the body becomes dull as the result of which the patient remains unconscious for a time and then falls asleep. It is possible that after the fit his mental condition may not remain normal. In this condition, he has no feeling of responsibility towards his duties.

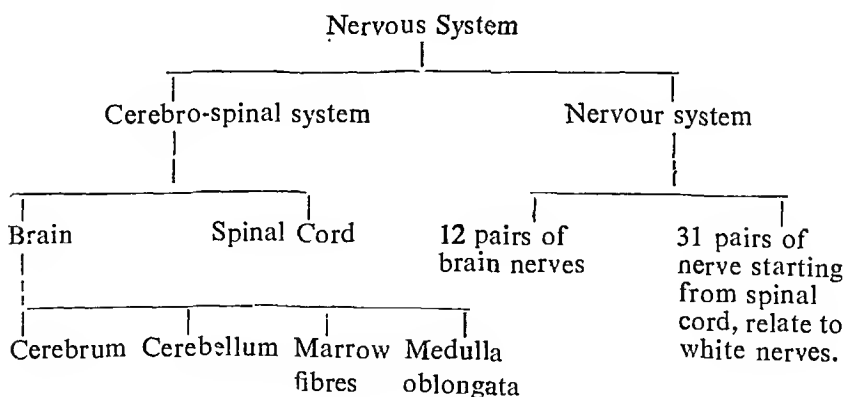
The fit in a patient suffering from minor epilepsy is ordinary and the duration is short. There is no contraction in the body. The patient becomes unconscious for a short period. Some seat also appears on the body during the attack. His body turns yellow and become stiff for a time. There are possibilities of major accidents during an epileptic fit.

After a fit of minor epilepsy, the patient generally becomes normal and performs his work as usual. But sometimes it also happens that his mental condition remains disturbed and he is not in a position to decide as what to do and what not to do. In this state of mind, he is not responsible for what he does.

Care should be taken to protect the patient from injury during the attack of epilepsy. If bleeding starts due to injury it should be stopped. The patient should be made to sleep on his back and his clothes be removed. Everything likely to cause injury to the patient should be removed from his surroundings. Care should be taken to see that the patient does not bite his tongue. Something should be placed in the mouth so that he may not be able to bite his tongue. He should be allowed to do whatever he pleases. During the attack, cold water should not be sprinkled over his face. He should be allowed to sleep undisturbed and soundly.

The daily routine of the patient should be regularised as the first precautions against recurrence of the attack. He should be given light and easily digestible food, at proper intervals. He should sleep as much as possible. He should not be excited. He should live in a place where fresh air and sunshine are in abundance. Such children should be sent to special institutions, where they may get education according to their mental state.

SUMMARY



1. Special Centres—Main four (1) Auditory word centre, (2) Visual word centre, (3) Motor speech centre, (4) Writing centre. Word deafness is caused when auditory word centre is not fully

developed and when visual word centre is not developed word blindness occurs.

2. Mentally, deranged children—(1) Backward child, (2) Dull child, (3) Feeble-minded child, (4) Imbecile, (5) Idiot, and (6) Morally defective child. These children should be imparted vocational training under the guidance of specialists.

3. Diseases of Nervous system—(1) Chorea or St. Vitus' Dance, (2) Stammering, (3) Hysteria, (4) Epilepsy.

EXERCISES

1. Describe briefly the various parts of the brain and their functions.
2. Draw a sketch of the brain and spinal cord and show how and with which body parts they are connected.
3. How does narcotic drugs or alcoholic drinks affect the nervous system ?
4. Prove that the functioning of nervous system depends upon the movement of body parts.
5. What do you mean by 'Mentally defective children' ? Write short notes about them.
6. What do you know about the diseases of nervous system ? Give a detailed account of the same.

Chapter Eleven

The Reproductive System

The organs that produce a child are called reproductive organs. The reproductive organs of male and female differ in shape and formation.

Male Organs

The male reproductive or genital organ is divided into two parts. One is the external organ which comprises of penis and testicles and the other is internal organ which lies in the pelvic girdle. The second part is not visible from outside. This part comprises of spermary ; vasa efferentia, penis root gland etc.

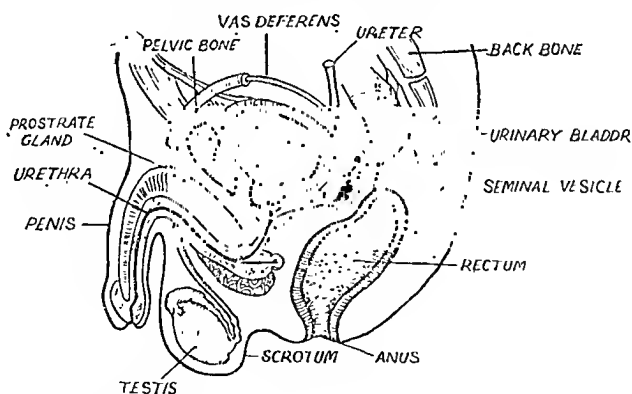


Fig. No. 28 The Male Genital Organ

Penis.

Penis is the main genital organ through which the male sperm reaches in the female vagina and the act of copulation is performed.

Urine comes out of the body through this very organ. Ordinarily the penis is three to four inches long-but becomes longer, thicker and stiffer when the desire for intercourse is excited. In this state it penetrates the vagina and measure four to six inches in length. This state of penis is called the erection state.

The front part of the penis is called glans penis. This part has a hole in it through which both semen and urine pass. This is called urinary passageway. The penis has a skin cover over it. This foreskin can be stretched forward or backward whenever desired. This foreskin is called glans penis skin or cover. The skin is hairless. When this skin is narrow and does not stretch upwards it produces pain during intercourse or during urination.

There is a cavity near the glans penis where a white smooth matter is accumulated. The matter is produced by certain glands of the glans penis. If this matter is produced in greater quantity and this part of the penis is not kept properly cleaned, small boils are likely to appear over it. It is, therefore, necessary that this part is kept well cleaned. The latter part of the penis is its root which is covered by testicles. Penis has no hair on it.

Inner Structure of Penis.

Penis is formed of fibrous tissues and involuntary muscles. It has three cylinder-like parts. Two out of these are on the upper part just near each other. These are called penis columns. The third part is situated in between the two parts and is known as urinary column. The third part is hollow inside. The urinary passage tube lies in the lower portion of this hollow part.

As already stated, the penis columns are cylinder-like in shape and it is because of this that there is some gap in their upper, lower and middle parts. In the upper gap there are two arteries, two nerves and one vein. The lower gap is deep where lies the urinary tube. All the three columns are made of white and yellow fibrous tissues with the involuntary muscles. There are small cells which are fitted with blood during erection of penis. This causes stiffening of the penis. As soon as after the intercourse these cells become empty, the penis becomes soft and inactive. The penis columns end before the glans penis. The glans penis is like a cover on their pointed end. The three columns separate with each other after reaching the root.

In the rear portion of the urinary column there is a muscle

attached to it. The urine flows out when it contracts. This muscle also contracts during the outflow of semen. Consequently, the penis becomes stiffer during semen discharge.

Testicles.

The sack suspending below the penis is called scrotum. In the thin skin of scrotum there is a layer of involuntary flesh. This skin expands and contracts which causes the scrotum, too, the increase and decrease in size. Cold contracts the skin while heat or warmth expands it. The scrotum is divided into two parts. Each part has a testicle in it. These testicles are known as right and left testicles. The testicles are like an egg in shape. They suspend a bit slantingly. The testicles in normal condition is $1\frac{1}{2}$ " long, 1" wide and 1" thick.

Sperm Glands.

The sperm gland contains two to three hundred cells which have eight to nine hundred tubes as thin as hair. These hairlike thin tubes are joined with each other by means of fibrous tissues. A big tube is thus formed by their joining together. This tube is called sperm duct. It goes up to the lower edge of the testicles. The tube is so zigzag that when straightened it measures 20 feet in length. Semen is produced in sperm glands and spermatozoon is its main constituent.

Spermary.

Behind the ureter and in front of rectum in the pelvic girdle there are two bladders about two to three inches in length. The upper end of these bladders is wide while the lower end is narrow. The sperm duct is joined with these bladders. This junction is the starting point of vasa efferentia which joins the urinary passage after passing through the prostate glands.

The matter that is produced in sperm glands is known as semen. It accumulates in spermary through sperm duct and after some time goes from here to the urinary passage through vasa efferentia.

Semen is a thick, white and gelatinous fluid. It has got a peculiar smell. When examined through a microscope, countless of spermatozoa are seen swimming in it in all directions. The presence of spermatozoa in semen are essential for producing a child. The healthy spermatozoa are active and fast while the unhealthy ones are

slow and less active. Those persons whose sperm glands do not produce semen with spermatozoa are incapable of procreation. The size of spermatozoa vary from $1/100$ inch to $1/500$ inch in size. The oval-shaped thick front of the spermatozoa is known as its head while the rear part is called the neck. After the neck there comes its body and tail. The production of spermatozoa in the human body begins as early as the age of fourteen or fifteen years, but at that age they are not capable of procreation. Healthy and capable of procreating spermatozoa are born in the human body between the age of twenty to twenty-five years. Spermatozoa are born in sperm glands only. The semen which passes from sperm glands to sperm duct is so thick that spermatozoa cannot move freely in the semen thinner. The secretion of spermary makes the semen still thinner. Secretion from prostate and penis root glands also mix in it at the time of copulation. In this way, it will be seen that semen consists of many kinds of secretions.

Prostate.

This lies in the pelvic girdle below the urinary bladder and parallel to rectum. The prostate glands are covered with a lining of fibrous cells. The secretion produced in the prostate glands mixes with the semen in the urinary passage through its thin veins. Enlargement of prostate glands in the old age block the urinary passage and cause the trouble during urination.

Female Organs

The female genital organs can be classified into two categories like the male genital organs.

- (1) Those visible from outside—like vagina.
- (2) Those in the pelvic region, not visible from outside, like ovaries, ovary ducts, uterus etc.

Vagina.

Whereas a man has penis and testicles, the woman has vagina. In the middle of vagina there is a canal on both sides of which are labiums. There are two passages inside the vagina. The bigger passage is known as vaginal canal. The blood comes out of this passage during menses. The child is born through this passage. The male organ penetrates through this very passage during cohabitation. Half inch deep inside the vagina is another passage with smaller mouth. This is the urinary passage. Urine comes out through this passage.

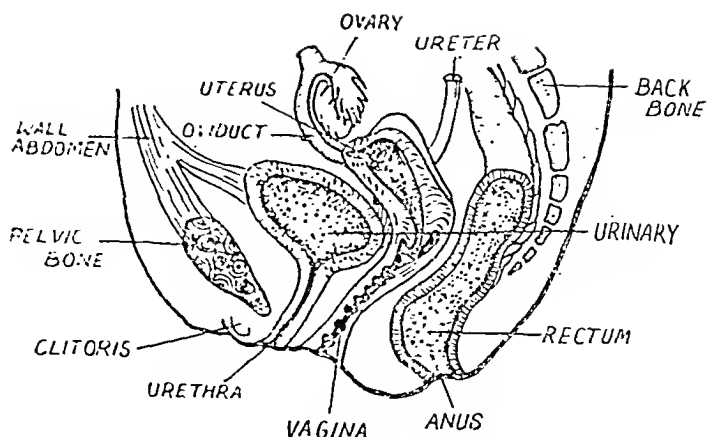


Fig. No. 29 Female Genital Organs

There is a thin membrane with a hole on it which covers the vaginal orifice of a maiden. This membrane is torn when for the first time the erected penis enters the vagina with force as the result of which a little blood also comes out and there is some pain. This hole of the membrane is bigger in size in case of some maidens and the man with a penis of smaller diameter can perform the act of cohabitation with such girls without tearing the membrane. The tearing of this membrane and the enlargement of the hole are generally regarded as indications of girls having sexual intercourse. But this cannot be said to be a hard and fast rule because sometimes this membrane gets torn by an injury or hard physical labour.

Over the urethra there is a small organ called clitoris. It has two columns. Women have separate urinary passage. Blood flows in the clitoris making it stiff like penis at the time of intercourse. After the act of cohabitation is complete, blood flows back from the clitoris and it also turns sluggish like the male penis.

Ovaries.

A woman has two ovaries just as a man has sperm glands. Conception is caused when these meet spermatozoon. The two ovaries lie on the left and right side of the uterus. The ovaries are approximately equal in size to a pigeon's egg. These are an inch and a quarter long and quarter to an inch broad. There are about 72,000 ovary cells in these glands. As these cells increase in size a kind of liquid accumulates in them.

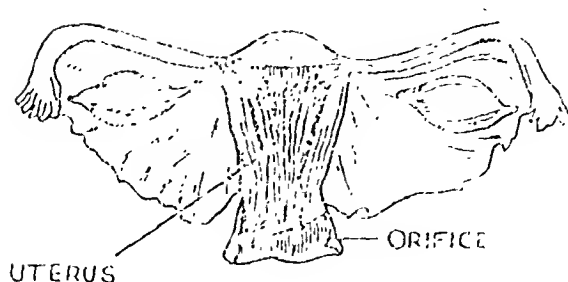


Fig. No. 30 Uterus and its Orifice.

The ovary cells generally ripe at the time of menses. An yellow object begins accumulating inside the ovary cells when they reach the stage of bursting. The colour of ovary cells turns yellow on account of this yellow object. After sometime, a yellow gland is formed. At the time of conception this yellow gland gets bigger in size.

Fallopian Tubes.

There are two fallopian tubes. These start from uterus and reach the ovaries. The fallopian tubes are narrow at the uterus end and funnel-like at the ovary end. The ovum remains in the fallopian tube till reproductive power is attained by it. The spermatozoon meets the ovum after passing through the uterus. In case, the conception does not take place, the ovum goes out along with blood and mucous at the time of menses. Ovums are pin-like and come out from both the ovaries alternately.

Uterus.

Uterus lies behind the urine bladder and in front of anus in the pelvic region. It is not in upright position, instead it appears to be bending forward. It resembles a pear in shape. On its both sides, there are the ovaries. The upper end of the uterus is broad. In its lower, there is a five inch long duct which opens in the outer direction. This is called vagina. Uterus is hollow inside and its walls touch each other. The separate after conception and the child grows in it.

Menses.

When the girl attains puberty, a fluid flows out of vagina every month. This phenomenon is called menses. The appearance of menses is called menstruation. It indicates that the girl's genital organs are developing the power of reproduction.

Besides menses, other symptoms indicating the advent of pubescence also appear for example, the development of breasts and hips and the appearance of public hairs, etc. In our country, the menstruation starts when the girl is between 12 to 14 years in age. The effect of climate, social environments and other atmosphere and the standard of living are factors that are also responsible to some extent for an early or late start of menses. In hotter countries, menses start at an earlier age as compared to colder countries where menses start late. The menses start early in the girls that are prone to reading sex literature and lead luxurious life. Nourishing and rich food is another factor that affects the menses. In healthy women, the state of menopause appears between the age of 45 to 50 years. Before the menopause the healthy woman gets regular menses every month except during the period she is pregnant and a few months after the childbirth. The menses stop totally when the woman attains the age of 45 or 50 years. This state is called menopause.

Menses appear after every 28 days and this state remains for a period of three to six days. A longer period of menses or its occurrence more than once a month is a symptom of some disease or disorder. During the period of menses, women appear lethargic and do not show interest in things or work.

The purpose of menses is to make the mucous membrane of uterus capable of reproduction. It also has some bearing with the maturity of the ovum. There are more chances of a woman getting conceived after menses. Menses is caused when the mature ovum reaches the fallopian tube. This happens every month. Conception is caused when the male spermatozoa meet the ovum at the proper moment. The ovum is lost if conception does not take place.

During the act of intercourse, the male organ rubs against the vaginal walls hitting clitoris. Both the man and woman experience great pleasure during the act. The glans penis reaches near the uterus and after some time it discharges semen. The semen comes out of the penis rushing and falls in the uterus. The act is complete after the discharge of semen and the male organ no longer remains stiff. At the completion of sex act both man and woman experience a peculiar satisfaction.

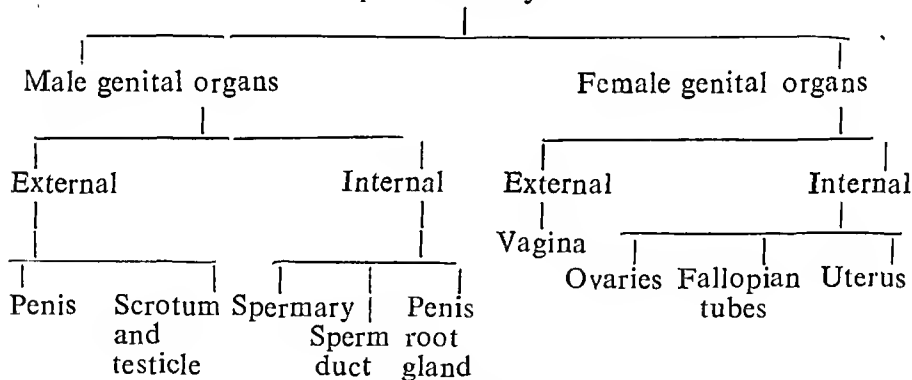
Conception.

Spermatozoa remain alive in for a number of days in the vagina and uterus. They have special attraction for ovum. Only a power-

ful spermatozoon can enter the ovum. The entry of spermatozoon in the ovum is called conception. The tail portion of the spermatozoon disappears when it enters the ovum and only the first half part mixes with the ovum. A single spermatozoon is capable of causing conception. Its stay, therefore, even for a moment in the uterus can cause conception. Conception takes place easily when both man and woman are healthy and are in the right age. After the conception occurs, the embryo cell leaves immediately the fallopian tubes and reaches the uterus. There in the uterus, it sticks to the mucous membrane and grows on the blood that is brought by the artery coming to the uterus. The conception thus taken place gradually develops in the womb and after a period of nine months, some baby is born.

SUMMARY

Reproductive System



EXERCISES

1. Write a note on the male genital organs.
2. Describe briefly the female genital organs and their functions.

Chapter Twelve

The Ear And Its Defects

Ears have very important place in the education of children because they hear and grasp through ears whatever the teacher teaches in the school. The sound waves reach the mind through the ears. The ear can be divided into the following parts :

- (1) External ear.
- (2) Middle ear.
- (3) Internal ear.

External Ear

The external ear is made up of cartilages. It has two main parts. The first part is known as pinnae (or shell-like structure) which has a number of projections. These are known by different names. The other main part is made up of fibrous tissues.

In the middle of pinnae is a pit wherein sound waves concentrate. The auditory canal lies in the surface of this pit. The auditory canal is a cave-like zigzag one inch long canal that enters the skull. The entire canal is covered with a thin flesh lining with tiny hairs. There are a number of small glands in it which secrete a poisonous, sticky and bitter kind of wax. This secretion is commonly known as ear wax. Foreign matter does not find its way in the ear because of the zigzag constructing of the auditory canal and the presence of hairs and ear wax. The presence of these objects creates obstruction in the easy passage of foreign matter to the ear. Small insects which somehow enter the ear stick to the wax and get destroyed.

The inner mouth of the auditory canal is covered with a disc-like thin membrane. This is known as eardrum or tympanum. The eardrum separates the external ear from the middle ear. When excessive wax is produced in the ear, it is deposited in the auditory canal causing obstruction to the passage of sound waves to the eardrum. At this time, the man slightly becomes hard of hearing. When such a state of affairs is reached it is advisable to get the wax removed and ear cleaned. Sometimes, people use wooden pricks or pins to remove this wax. This is not desirable because there is every likelihood of the eardrum being injured. Holes in the eardrum cause deafness.

Middle Ear

The middle ear is the inner cavity which is quarter of an inch thick. This lies between the eardrum and the internal ear. The middle ear is full of air. The eardrum separate it from the external ear. Inside there is narrow duct called throat-ear duct. This duct goes up to the throat. Equal pressure of air is maintained on both the sides of the eardrum on account of this duct. This duct saves the eardrums from bursting during violent explosion or loud noise which all of a sudden puts pressure on the eardrum. At such times, the air inside passes over to the throat and the eardrum is saved from bursting. Throat swelling can inflict the middle ear by travelling through this duct. Children commonly suffer from this trouble. Severe cold, catarrh and adenoids create obstruction in this passage causing tension in the eardrum. The result is that hearing becomes hard because there is less vibration in the eardrums.

There are three bones which are bound with each other through ligaments. We hear clearly because of the free movement of these bones. These bones carry the vibrations caused by sound waves to the inner ear. The hearing power is affected when ligaments of these get defective.

These bones are named after their shape and size and are called hammer, anvil and stirrup.

Hammer Bone. The hammer bone lies near the eardrum. It is hammer-like in shape. The upper thick and broad part is called its head while the lower narrow part is called neck. When we hear attentively, this muscle contracts and stretches the eardrum. This makes the man hear every word clearly. It is joined with the anvil behind the eardrum.

Anvil Bone. The shape of this bone is like the anvil of a goldsmith. It is joined in the front with the hammer bone and in the rear with the stirrup bone. Both these joints are movable.

Stirrup Bone. Its shape is like an iron stirrup. It is because of this shape that this bone is called stirrup bone.

The above three bones are joined with each other and it is because of this that whenever eardrum is shaken, the three bones are also shaken.

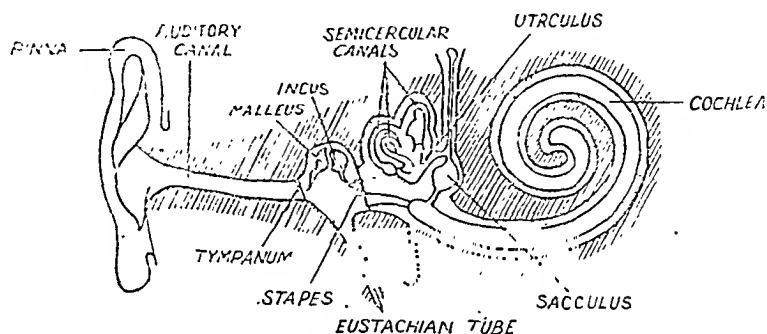


Fig. No. 31 Ear

Internal Ear

The internal ear is a complex mechanism which lies below the temple bone. Because of its peculiar and complicated shape it is also named snail ear. Inside it there is a close membrane sack which is filled with a clean fluid. This fluid is called endolymph. The membrane sack is called membranous labyrinth. It is an essential part of the hearing organ. The auditory canal ends here. Membranous labyrinth has three parts :

- (a) Vestibule
- (b) Cochlea
- (c) Semi-circular canals.

Vestibule.

This forms a central cavity in the internal ear. It is situated between the snail-shaped cochlea and the semi-circular canals. It grasps the sound from the cochlea in the front and from the semi-circular canals in the rear. In its outer wall there is an egg-like hole which is called vestibule orifice. In this orifice there is situated the broader part of stirrup. A membrane covers this orifice.

Cochlia.

It is snail-like in shape and lies in the lower part of the vestibule. It is attached with the middle ear through a circular hole. This hole remains covered by a membrane. These are a number of holes in the surface of cochlia through which nerves enter.

Semi-circular Canals.

These canals spring from the rear and upper part of the vestibule. These canals are three in number. These canals are situated in different planes and after making right angles against each other they join the openings of vestibules. One end of each nerve is swollen. Inside, there spread the fibres of auditory nerve. These have no direct relation with hearing but they maintain the balance of the body.

There are two small membranous sacks in the vestibule. One of these sacks lies in the upper rear part, while the other one remains in the lower front part. The sack in the rear part of vestibule is larger compared to the front one. Three membranous canals join it. Another thin canal emanating from the front part is joined with the cochlia.

Mechanism of Hearing

The vibrations of every sound-producing objects create vibrations in the air as a result of which sound waves are produced. These sound waves travel at a velocity of 1100 feet persecond and collect in the external air from where they enter the auditory canal. The sound waves spread in all directions around the object in the manner of those water waves that are produced round the stone which is hurled in water. The water waves start in all directions from the place where stone falls and it appears that water reaches the shores along with the point where the stone falls and some movement is produced but this water does not go along with the waves to the shore. It moves only to a little distant from where the stone had fallen. A similar condition exists in the vibrations of air also. The vibration is most near the sound-producing object but the intensity of vibration decreases as the distance increases. It is on account of this reason that the sound is loud nearer the sound-producing object and gradually the sound becomes less audible as the distance increases.

This has already been stated earlier that sound waves enter the

external air with air. From there they enter the auditory canal and strike against the eardrums. The eardrums shake due to sound waves striking against them. With eardrum the three bones also get into motion. Being outside the eardrum the movement of these bones are in another direction. This movement in turn sets the fluid inside the vestibule and cochilia in motion. The information regarding the vibration in the fluid are carried to the auditory centre of the brain through auditory nerve and thus we sense sound.

Deafness

There are different categories of deafness :

- (a) **Deaf and Dumb.** Persons being deaf by birth also turn dumb.
- (b) **Semi-dumb.** Some persons turn deaf during childhood. They having some experience of hearing and being not totally deaf can be educated by speech method.
- (c) **Deaf.** Some persons turn deaf after learning speaking. They can be successfully taught through speech method.
- (d) **Partially Deaf.** This means hard of hearing.

Causes of Deafness

Defects either in the external, middle or internal ear cause deafness. Deafness is either by birth or occurs at any time during life. The causes of deafness can be divided into the following categories :

- (a) Obstructions caused in the auditory canal either by the accumulation of too much of wax or by enlarged tonsils or adenoids. The auditory canal's end gets blocked by the enlarged tonsils and adenoids with the result that air does not reach the middle ear. Consequently, the child turns deaf.
- (b) Injury caused to the eardrum by some external object turns the child deaf.
- (c) The child begins to hear hard if the middle or the internal ear is diseased. Whooping cough, pneumonia, influenza, scarlet fever, measles and enlargement of tonsils create throat trouble and the germs of the disease reach the middle ear through eustachian tube. This causes swelling of the middle ear and pus is also formed. This pus falls on the

hole of eardrum and the infection reaches the sound carrier bones. This causes defects in the mechanism of hearing.

- (d) Defective auditory nerve or faulty development of hearing centre turns the child semi-deaf and dumb. Injury is another contributory factor.
- (e) Meningitis is also responsible for turning a child deaf.

Symptoms of Defective Hearing

- (1) Continuous trickling of pus from the ear,
- (2) Child appearing tired and lethargic,
- (3) Buzzing sound in the ear,
- (4) Pain in an ear,
- (5) Headache,
- (6) Inhaling air through mouth,
- (7) Lack in concentration,
- (8) Bending of head in a direction while reading, and
- (9) Unable to bear everything that the teacher tells, because of not seeing the face of the teacher.

Caring of Ears

It is necessary to pay attention to the following for the safety and health of the ears :

- (1) Teeth, nose and throat should be kept clean. The infection of throat reaches the middle ear through eustachian tube and adversely affects the hearing.
- (2) Ears should not be cleaned through hard things like wooden picks or pins, because thereby eardrums are likely to be damaged.
- (3) Ears should be got cleaned at regular intervals so that dust may not stick in the auditory canal.

Hearing Test

Audiometer is the best medium of testing a man's hearing. A number of head phones are attached with the gramophone of audiometer which are used for examining specially made gramophone records. Sound that gradually becomes weaker is produced by these records. The child hears and notes down on a notebook. In

this way, his hearing is tested. This test, although satisfactory is costly.

For testing the hearing power 'whispering test' is also applied. Generally, this method is used in schools. In this test sound is gradually weakened from a distance of 20 feet to the extent when it is not audible. Sometimes, it becomes difficult to perform this test in the noisy atmosphere of the school.

Hearing power is also tested through watch sound. In this method the hearing power of the student is compared with that of the normal hearing power of the examiner. The result of this test is expressed as a fraction for each ear. The result of this test is expressed as a fraction for each ear. The result of this test can be affected by the noise of the room. Difference in the sound of watch, too, can affect the result. This test is, therefore, not very reliable.

Education of Children Having Defective Hearing

Many things told and explained in the class-room prove futile for the children with defective hearing, because they do not hear all of it. Special arrangements should be made for the education of such children. Children hard of hearing should be sent to special schools. They could also be sent in ordinary schools but they need the care of an expert teacher. Their classes should not contain more than ten students because it is only then that the teacher shall be able to give his personal attention to each boy. In such cases these boys are influenced by others also and in this way they are not at any disadvantage.

Separate arrangements should be made for semi-deaf children and they should particularly be given vocational education. Vocational education is absolutely necessary for children who are totally deaf. Such children should be educated in tailoring and embroidery, weaving, dyeing, cooking, carpentry, leather work, book-binding etc. Particular attention should be paid towards their physical development because deaf and dumb children are generally found to be indifferent towards their health. They should be encouraged for taking regular physical exercises. Arrangements should also be made for games and sports so that their proper physical development may take place.

Common Ear Diseases

A slight pain in the ear should be taken as an indication of some disorder in the ear and immediate attention should be paid to

it. Swelling in the middle ear generally causes pain. Sometimes, ear discharge begins to flow out. Scarlet fever, measles, cough and adenoids, too, cause this trouble.

Early treatment should be started in such condition because not only it affects the middle ear causing deafness but the infection can also reach the temple bone and in that case, the consequences are very serious. It can also affect the brain or its membrane. Fatal diseases can appear. It is because of these that the ear discharge or otorrhoea should not be neglected.

SUMMARY

The ear is divided into three parts : (1) External ear, (2) Middle ear and (3) Internal ear. There is an inch long cave like canal in the pinnae called auditory canal. The inner orifice of the auditory canal is covered by eardrum. Foreign matter cannot enter in the ear because of the zigzag formation, and the presence of hair and wax inside it.

The middle ear lies between the eardrum and internal ear. Eustachian tube lies in the middle ear. It balances the pressure in the air. There are three bones in the middle ear called hammer, anvil and stirrup.

Internal ear situated in the temple is a very complex mechanism. Inside it there is the membranous labyrinth which has three canals called vestibule, cochlea and semi-circular canals. Semi-circular canals are three in number.

Hearing Mechanism.

The vibrations of the sound-making object produce vibrations in the external ear, auditory canal, eardrum, three bones, setting in motion of the fluids in vestibule and cochlea-hearing centre in the brain affected through auditory nerve and thus man hears and understands the sound.

Deafness is of four categories : (1) Deaf and dumb, (2) Semi-dumb, (3) Deaf, (4) Hard of hearing. They should be given vocational and practical education.

Hearing testing : (1) Audiometer, (2) Whisper test and (3) Watch test.

EXERCISES

1. Describe briefly the various parts of the ear.
2. Explain through an illustration how the brain grasps the sound waves and understands them.

Chapter Thirteen

The Eyes And Sight

The eyes are the most important organs of the human body. It is through them that we see every object in the world. Information regarding the objects that we see immediately reaches the mind. Sometimes, we feel headache, fatigue, lack of interest, backwardness, disinclination and mental disturbances etc., when defects appear in our vision. This shows how vital eyes are for us and how important, it is to protect them against defects and diseases. It is necessary to have a knowledge about their functions and structure in order to save them from falling victims to defects and diseases.

The Structure of the Eye

Eyes are made of optic lobes. These lobes are hollow from inside and are slightly flat. Their front part is a little projecting. The diameter of the optic lobes is approximately an inch. The optic lobes are situated in the middle of cheek bone's cavities. The outer part of these cavities is filled with fat that protects the optic lobes from injuries. It could thus be seen that eyes are safely placed in a strong and well-guarded bone fort. The front of the eyes is protected by eyelids with eye-lashes on them. The eye-lashes protect the eyes while the eyelids remain open. The inner part of the eyelids that comes in contact with the eyes is covered with a smooth and soft membrane. This membrane is transparent and is called conjunctiva. This is also an eye's protector in as much as it guards the eyes against the attack of germs of various diseases. The membrane remains wet due to its own secretion as well as on account of tears coming out of lachrymal (tear) glands.

Lachrymal glands lie in the upper and outer corners of each eye cavity. Tears are produced by these glands. The function of tears is to protect eyes from dust, germs and other objects and remove them out of eyes. Another function of the tears is to keep the eye surface clean. The secretion from tears glands accumulates in the lower layer of conjunctiva. It then passes through a small duct in the bone to nose. When tears are produced in large quantity it flows direct from the eye over the cheeks. The nose, too, at this time becomes wet due to excessive secretion from lachrymal glands.

There are a number of meibomian glands at the root of eyebrows. These glands have been named after the man who discovered them. These glands are useful in two respects. Firstly, they keep the ends of the lashes wet and smooth as the result of which the upper and lower eyelids do not rub against each other to an irritating extent causing friction. It also helps eyelids to rise and fall effortlessly and smoothly. Secondly, these glands create a stricky border which allows only the unwanted and excessive quantity of tears to fall down direct over the cheek. Styne (boils) appears on the eyelids when openings of any of these glands are blocked.

The eye wall consists of the following three layers. Each layer has two cells which are full of transparent matter :

- (1) The outer wall which consists of sclerotic (white of the eye) and cornea.
- (2) The middle layer which consists of choroid and iris.
- (3) The inner layer which consists of retina.

Sclerotic and Cornea

The sclerotic has a hard fibrous membrane and surrounds 5/6 part of the eyelid. It is transparent in the front so that light may enter through it. This much portion is known as cornea. It covers the coloured part of the eye. Light enters the eye through cornea.

The functions of the sclerotic are to protect the inner part of the eyes, to keep the eyes circular and to save them from deformity. The shape of the eyes turns ugly when sclerotic extends or gets damaged. In the hind part, it is attached with the thick cord-like optic nerve. There are a number of muscles attached with the outer part of the sclerotic. These muscles help the optic lobe to turn in different direction.

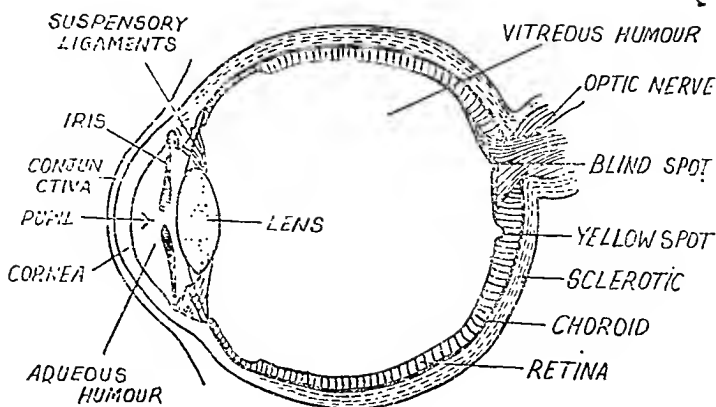


Fig. No. 32 Eye

Choroid and Iris

A blackish brown membrane inside the surface of sclerotic and attached to it is called choroid. The matter which darkens the inner part of optic lobes and protects it from dazzling lights remains in the cells of this surface. Those animals and birds which are deficient in that black matter cannot see clearly objects in the daylight. Those persons who are sunblind are also deficient in this black matter. Such persons turn blind during daylight. Like the sclerotic, choroid, too, is joined with the optic nerve from behind.

A disc-like black cover situated behind the cornea at some distance is called iris. On the inner surface of choroid are visible a number of furry spread, while on the outer surface is disc-like collection of a number of furry muscles. The iris visible in the cornea is made up of fibres of contracting muscles. The matter that gives different colours like blue, brown, black etc. remains deposited in the iris in different quantities. A small hole in the centre of iris is known as pupil. There are two kinds of disc-like and horizontal-involuntary muscle fibres in the iris. The main function of these fibres is to control the size of the pupil and also the light that enters the eyes. The disc-like muscular fibres contract in the light which narrows down the pupil's opening.

Lens

Just behind the iris is situated a pair of bi-convex lenses about half an inch in diameter. It is like a circular, flexible, crystalline

and translucent. It divides the optical lobe in two parts. It is a solid gland made of soft, gelatinous live tissues. It remains in contract with furry muscles. When the muscles contract the lens gets pressed and the hanging bonds relax. The lens as the result of the above action becomes more bi-convex. The lens power of contraction and expansion is called the accommodation power. Due to the accommodation power the eye fixes itself at particular position while reading or concentrating on minute details. The eyes are not tired much when seeing distant objects because the ciliary muscles do not contract and remain in natural position. They eyes should be rested and practised to see distant objects after concentrating on some object. The function of the eye lens is to throw the light rays on the screen like the camera lenses.

It has already been stated earlier that the lens divides the optic lobe into two parts. In the front part there is a colourless fluid which is called aqueous humour. In the rear portion, there is another liquid which is transparent like jelly. This liquid is called vitreous humour. These two fluids project the light rays entering the eyes so that these rays fall properly and at the right place on the retina and help the proper functioning of the eyes. The vitreous humour provides strength and size to the optic lobe.

Retina

After the choroid layer comes the retina. The retina is made up of optic nerves. The retina has a number of layers. The most important of them are called rods and cones. The functions and shape of rods and cones vary. The rods help us to see in dark while the cones help in seeing in day-light. The rods and cones transmit the effect of light to the brain for analysis through the help of optic nerves. The images seen in the retina are produced because of the above action of the rods and cones. The place at which the effect of light is analysed is known as yellow spot. The images become distinct, when the light rays are centred on this spot. This spot helps us in executing minute works. It is like the sensitive lens of the camera. This spot is the centre of clear vision. Only cones are firmly fixed here. Outside, bot rods and cones are fixed together. The number of cones is less outside the retina.

The other important part of the retina is called the dark spot. The optic nerves enter the optic lobe at this spot. This part of the retina does not help in seeing because rods and cones do not exist there.

Action of Optic Lobes

Four straight and two oblique muscles are attached to the optic lobe. The optic lobe turns in different directions with the help of these muscles. Four straight muscles coming from behind the optic lobe enter on both the sides in the upper part. The optic lobe moves upwards, downwards and sideways with the help of these muscles. The oblique muscles enter slantingly in the upper and lower part of the optic lobe. Their contraction makes the eye move on its axis.

With the help of the above two varieties of muscles, the optic lobe can move in different directions. Generally, both the eyes move in a direction simultaneously. This keeps the axis of optic lobes at equi-distance.

Sight

The sight depends on the action of the light rays coming from an object and falling on the lens. It is necessary for clear vision that the light rays coming from an object should be centred on the rerina. This creates an image of the object seen on the retina. The light rays coming from an object within a distance of 20 feet are generally widespread while those from a more distance object are parallel or equi-distant. The eyes see both the objects and have the power to deal with both kinds of light rays. The widespread as well as the parallel light rays need bending before centring on the retina. It is possible only with the help of a double bi-convex lens. It has

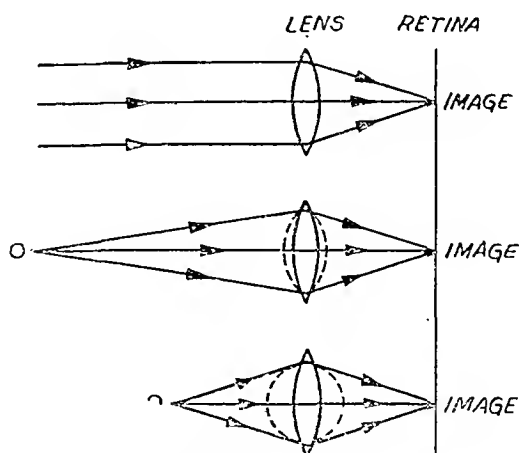


Fig. No. 33 Sight

the power to bend and turn the rays oblique. With this action of this lens, images of objects coming from near as well as from distance are formed on the retina. The accommodation power of the lens by increasing its curve and bend, focusses the light rays on the retina forming the images of the objects from which the light enters the eyes, whether these objects be at hand or at a distance. The parallel light rays coming from a distance object focus on the retina without its exerting any pressure, but the tight rays coming from the nearer objects exert pressure on the retina, because they need curving and blending before focussing on the retina. Here the accommodation power is needed most. The nearer the object the greater pressure it exerts, because the light rays need curving and blending before focussing on the retina. In so doing when the ciliary muscles force the choroid and ciliary outwards their hold on the suspending bonds of the lens loosen and the lens projects outwards. The nearer the object the greater would be the contraction of muscles as the result of which the lens will project forward. They eye muscles are more strained when a man reads or writes from a short distance. This makes the muscles weak as the result of which the sight becomes defective.

Defects of Vision

There may be many kinds of defects in the vision. We are mentioning some of these below :

Short Sight or Myopia

The sclerotic expands in the direction of its weakest part behind when excessive strain is exerted on it and it finds itself unable to bear it. As a result, the optic lobe becomes larger than the normal size in the rear portion in comparison to the front portion. This creages greater distance between the lens and the yellow spot. Under such conditions, the parallel light rays coming from a distant object focus before reaching the retina. The result is that the image formed on the retina becomes blurred. (See Fig. No. 34)

The use of a concave lens makes the light rays spread before these enter the eye with the result that the eyes focusses them on the retina. In this way, short-sightedness can be overcome. (See Fig. No. 35)

The cause of short-sightedness may be classified into two categories : (1) determining factors and (2) pre-disposing factors.

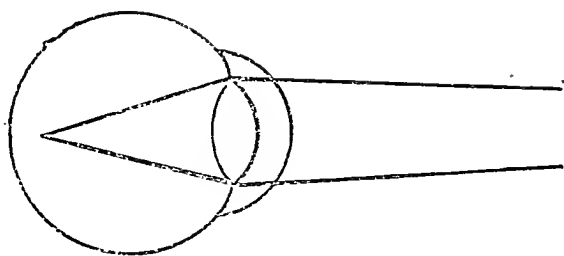


Fig. No. 34. In a myopic eye the image of distant object is formed in front of the retina.

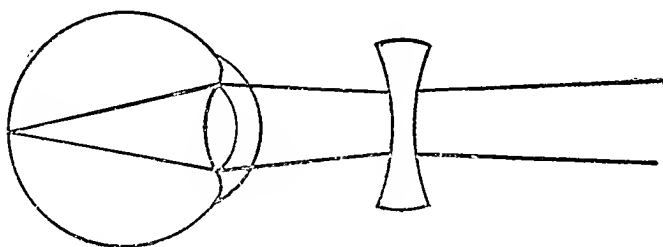


Fig. No. 35. Short-sightedness could be overcome the use of concave lens.

Determining Factors

Strain is not exerted on any muscle for seeing an object at a distance of about 20 feet or so, but strain has to be applied for seeing a nearer object. The position of the eye undergoes certain changes like bending or getting curved while viewing nearer objects, reading small letters or sewing or doing needle work. Both the eyes are drawn towards each other. This pulling work is done by the connected inner muscles. The nearer the object the more the eyes are drawn towards each other. This naturally results in greater strain on the eye muscles. Due to bends and curves, images are formed on the yellow spot of the retina. This causes enlargement of the sclerotic which is the main reason responsible for short-sightedness.

Pre-disposing Factors

These factors may be divided into the following categories :

- (a) **Poor and Unbalanced diet.** Lack of nourishing and balanced diet also causes myopia. The sclerotic and other eye tissues of children who do not get nutritious and balanced diet get weak as a result of which they become incapable of bearing more strain.

- (b) **Diseases.** Body diseases also cause myopia. The sclerotic two becomes weak along with other body parts due to ailments. Consequently, its power for bearing strain diminishes along with other body limbs and the eyesight becomes weak and defective.
- (c) **Heredity.** Heredity is also a factor that is responsible for this eye disorder. The child inherits a weak sclerotic from his parents which in course of time causes myopia.

Symptoms of Myopia

- (1) The child brings the book nearer to his eyes and bends over it while reading. He cannot read book from a reasonable distance. He cannot also read what is written on the black-board and if he somehow reads, it is full of mistakes.
- (2) The child feels headache.
- (3) His eyelids and eyes get swollen.
- (4) Water trickles down from his eyes.
- (5) He feels itching in the eyes.
- (6) Styes appear on eyelids.
- (7) The eyes appear dull and sluggish.

Treatment for Curing Myopia

- (1) If the above stated symptoms appear in a child the teacher should get him examined by the school physician and proper treatment be arranged.
- (2) The children should be taught the right way of sitting while reading, writing or doing needle work.
- (3) The habit of reading books in a correct manner should be developed in the child.
- (4) Such children should sit in the front row in the class.
- (5) They should be advised to use crooks lenses.
- (6) The children with these defects should be sent to such schools where their treatment may be possible and the advance of the disease may be checked.

Long Sight or Hypermetropia

This defect arises when the optic lobes become very small or flat. This defect comes by birth. With the appearance of this defect, the light rays do not focus properly on the retina. The light rays coming from a distant object focus behind the retina. Consequently, a clear image is not formed on the retina. This defect can

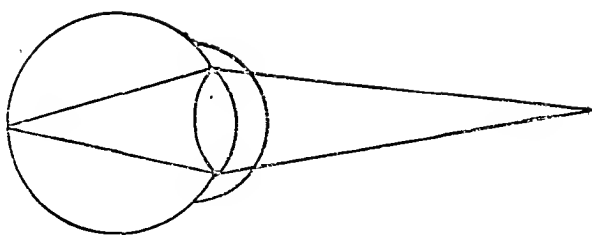


Fig. No. 36. In the long-sight of hypermetropia, the image of the distant object is formed on its retina.

be removed to some extent through accommodation. This causes curves in the light rays and they concentrate on the retina.

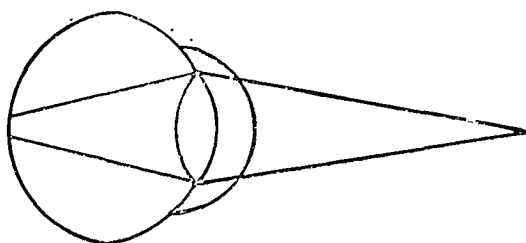


Fig. No. 37. In the long-sight the image of a nearer object is formed behind the retina.

The eyes of the children become small and go deeper in the socket when the defect of long-sight or hypermetropia occurs. The pupils contract. The children experience headache, blinking and redness appear in the eyes. Water also trickles down from their eyes. Children should be advised to use convex lenses for overcoming this defect.

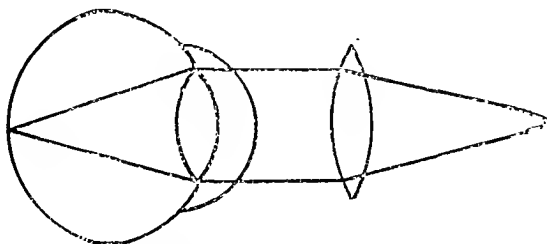


Fig. No. 38. Long-sight or hypermetropia removed through projecting lens.

Astigmatism

This defect is caused when unequal curves of cornea are produced on retina. This causes obstruction in the proper focussing of the image as the result of which the image becomes indistinct. With the appearance of this defect, sometimes one part of an eye suffers from short-sight while another part of the same eye suffers from long-sight. In this state of the eye when a man sees across he can only see one line clearly. This condition arises because some part of the image is formed on the retina while some part is formed in the front of as well as behind the retina also.

Squint Eye

The two eyes cannot see in the same direction at the same time when this disorder sets in. This disorder is of two kinds according to the position of the eyes. In one case, the eye sees in the direction of the other eye. The squint eye appears to be dropping in this kind of disorder. In the second category of the disorder, the eye sees in the opposite direction of the nose either upwards or downwards.

As soon as symptoms of this defect appear in an eye, a specialist should be consulted. Use of correct glasses are beneficial in this disorder. The defective eye should be put to more use. This would give it more power and the defect would thus disappear gradually. Operation of the eye is also useful and the enlarged muscles or the contracted ones are set right.

Blindness

Blindness is caused when swelling appears in the eyes of children. Gonorrhoeal contagion at the time of the birth causes this disease and as a result the power of transparency of the cornea is lost. Short-sightedness can also cause blindness. Congenital syphilis or cataract can also cause blindness. Injury to the eye or some other contagions, too, produce blindness.

The school doctor should be informed about such children and proper treatment should be provided with the consultation of an eye specialist. Every child's eyes should be examined at least once a year. This will reveal to the doctor the presence of the disease or disorder, if any, and due treatment should be given in the early stages.

Special Care of Children with Defective Vision

Generally, eye defects are overcome by the use of proper

glasses, but there are some defects that continue to develop. Children suffering with such defects should be given particular care and arrangements should be made for special type of education for them. The children with defective vision may be divided into the following categories :

- (1) Short-sighted or myopic children.
- (2) Semi-blind children.
- (3) Blind Children.

Education of the Myopic Children

Such boys should be admitted in special institutions and should be left in the care of teacher there. Personal attention is needed for their education. Not more than sixteen or at the most 20 students should be kept in a class. These children cannot strain their eyes too much in reading or writing. They should, therefore, be given more oral education. In educating them, books with bold prints and charts should be used more. The black-board should be used for writing. Such education should be imparted to them that may not overstrain their eyes and which might also help them in future in earning their livelihood. They should be encouraged and taught drill, dance and other sports. They should also be told to work in sufficient light. Their eyes should be examined at reasonable intervals in order to know the progress or deterioration of the sight, and a chart should be maintained about this report for guidance.

Education of the Semi-blind Children

This category comes between the total blindness and short-sightedness. If, in the opinion of the eye specialist, the children's semi-blindness is ordinary, arrangements should be made for their education along with the myopic children but if semi-blindness of these children is in an advanced stage, special arrangements for their education should be made or they may be admitted in the institutions run for blind children.

Education for the Blind Children

In this category, besides totally blind children, such other children are also included which are unable to read books due to defective vision. Such children should be admitted in school meant for blind children with specially trained teachers. In these classes, the number of students should not exceed more than ten in a class. They should be educated through Braille system. In this system,

education is imparted through raised words, dots which stand for different letters.

Vocational training in weaving of cane chairs, baskets, mats and polishing and carpentry should be given to these children.

Common Eye Diseases

The following are some important eye diseases worth mentioning :

- (a) *Stye*.
- (b) Swelling of eyelids or *Blepharitis*.
- (c) *Conjunctivitis*.
- (d) *Keratitis*.
- (e) *Cataract*.

Stye

When the meibomian glands on the eyelids swell, small boils or *stye* appear on the eyelids. These are caused by over-straining the eyes, rubbing them with dirty hands or uncleaned towels and also due to the indisposition of the body.

These should be treated by mango leaves or plum leaves. They are cured easily by this treatment. Applying lead oxide mixed with oil, too, produces beneficial effect.

Blepharitis

In this disease, the eyelids swell and become thick. They turn red. Sometimes, a thin coating is formed on their ends and eyelashes fall down.

Germs enter the eyes when these are rubbed by dirty hands or towels causing this disease. The disease is also caused in the absence of nourishing and balanced diet. Sight defects also appear due to swelling of eyelids.

The eyes should be washed with a solution of soda bi-carbonate. After washing them, germicidal ointment should be applied on the eyelids. Fomentation of the eyes also proves useful.

Conjunctivitis

This disease causes redness in the eyes and tears begin to trickle down. The dirty discharge from the eye dries up over the eyelashes in the night as the result of which the two eyelids stick to each other. It is a contagious disease. It causes pain in the eyes. During the day-light trouble increases, as eyes cannot bear the sunlight.

For curing this disease it is necessary that eyes should be washed with lukewarm water and germicidal ointment applied on them. It is not advisable to put any bandage over eyes during this period, because it will create dampness, darkness and heat which is an ideal condition for the multiplication of germs. The bandage will also not allow the dirty thick white discharge from the eye to come out. The child suffering from this eye trouble should not be allowed to attend the class so that other children may not catch the infection. The child should be sent to an eye specialist for treatment.

Keratitis

In this disease white blisters appear round the cornea which cause considerable pain to the eye. Sometimes, due to the growth of these blisters, the sight is completely lost. This disease generally appears when the child is five year old. Defects in the teeth, poor diet, adenoids and the habit of inhaling air through mouth are some of main causes of this disease. This disease should be treated by sun-rays or artificial light rays (ultra-violet rays or infra-red rays). Such children should go to special school.

Cataract

The transparent power of the eye lens is lost in this disease. Consequently, the lenses become full of darkness. Injury to the eye or ordinary eye troubles lead to this disease. The eye suffering from cataract should be operated. Special type of glasses should be used during the disease so that light rays may focus correctly on the retina. Cataract generally appears in old age.

SUMMARY

The main parts of the eyes are—sclerotic cornea, choroid, iris and retina.

The sclerotic protects the inner parts of the eye and saves them from deformity. In it there lies a number of muscles that help the eye to move in various directions.

Choroid has an element in it that protects the eye against the dazzle of light.

Iris is a disc-like black screen. The pupil lies in it and behind it, there is the eye lens. Eyes are capable of seeing minute objects because of the accommodation power of the lens.

The important layers in the retina are called rods and cones. Rods help the eye to see in darkness while cones helps to see in light.

The movement of optic lobes depends on the six connected muscles.

Vision defects are of the following kinds :

Short-sightedness or myopia, long-sightedness or hypermetropia, astigmatism, squint and blindness etc.

The common eye disease are sty, blepharitis, conjunctivitis, keratitis, cataract, etc.

EXERCISES

1. Describe in detail the structure of the human eyes and explain it with the help of illustrations.
2. What do you understand by defective vision ? What are its symptoms and how can these defects be removed.
3. Give an account of the common eye diseases.

Chapter Fourteen

Ductless Glands

There are some glands in the body that secrete juices which are of use to the entire body. This means that secretion from these glands is not of local importance but important for whole body. There are no ducts in these glands to carry the secretion to a particular spot in the body. It is because of this characteristic that these glands are named ductless glands. The secretion produced by these glands mixes in the blood of lymph and reaches every corner of the body. This secretion is called hormone. Their proper functioning keeps the body in a healthy state. These are, therefore, very important for the body. The following glands are particularly worth mentioning :

(1) Pituitary gland, (2) Thyroid gland (3) Parathyroid gland, (4) Thymus gland, (5) Adrenal gland (6) Islets of langerhans, and (7) Gonads.

Pituitary Glands

The gland that suspends by the lower duct of the brain is called pituitary gland. It is a small reddish brown gland. It has two lumps that secrete juice that helps the development of bones and keeps the body in good health. This secretion controls the large limbs. The height of man increases due to excess of this juice. The head and hands of such men become larger. Lack of secretion from this bone checks the development of bones. Consequently, the individual becomes dwarf. Such children are also not fully mentally developed.

The secretion from the rear gland controls the movement of intestines, blood pressure and blood sugar. Lack of this juice results into inadequate heat and energy in the white element of edibles. These turn into fat as the result of which the child becomes fat and his appetite increases. He loves to eat sweet things and turn lazy. Besides, the secretion from this juice also affects other ductless glands like thyroid, adrenal and gonad gland. The secretion from this gland also helps in the proper functioning of other body organs.

Thyroid Gland

This important ductless gland is brownish red. It is throat gland and is divided into two parts. One part lies on one side of the trachea while the other in another side. The secretion from this gland affects the entire chemical reactions of the body which helps the full development of the body. It is nourishing. Lack of this juice turns the child weak, his intelligence, too, becomes feeble and the shape of his head and face are deformed. This secretion is iodine mixed. The production of this juice is less in men living in places that lack iodine. Consequently, persons residing in such places fall victim to goitre. To remove this iodine or 'extract from the harmones of sheep glands' should be used.

Excessive activity of thyroid gland result into a condition known as exophthalmic goitre. This disease reduces the weight of the body and the person dies prematurely.

Parathyroid Glands

These pea-shaped glands are attached on the left and right of the back part of thyroid gland. Parathyroid glands control calcium and metabolism. If these are removed from the body, deficiency of calcium occurs, tetany appears in the neck and the muscles automatically contract. If these glands are more active, too, much calcium is produced in the body and the muscles turn weak. (See Fig. No. 39)

Thymus Gland

This rosy grey coloured gland lies behind the chest bones below the neck. Its functions are yet to be determined. However, at present it is thought that it is related to sexual growth. Its functioning stops at the age of 14 or 15. Although after this age it is sometimes found in some persons but they are physically and mentally weak.

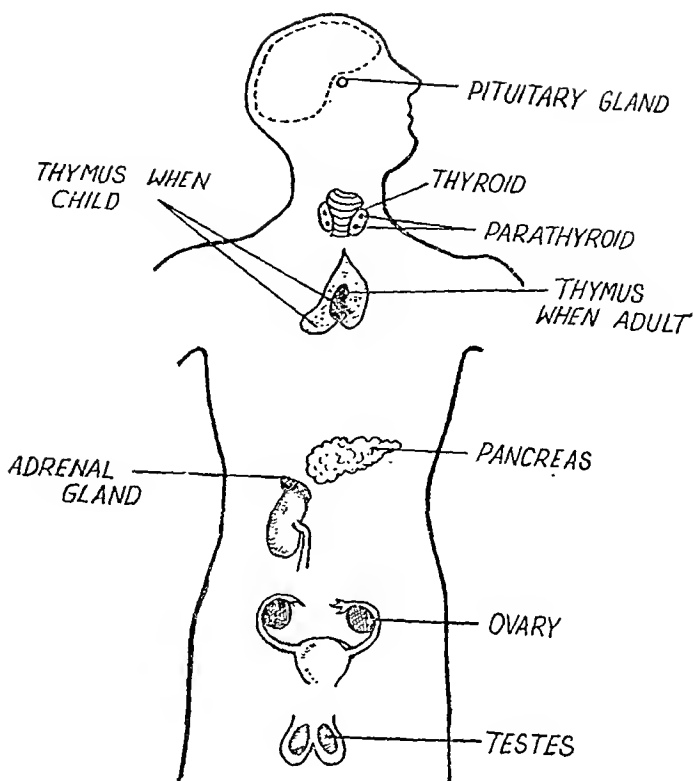


Fig. No. 39 Ductless Glands

Adrenal or Suprarenal Glands

These two lumped glands like just above the kidneys. The secretion from these glands keeps the blood circulation in order and maintains the correct proportion of sugar in it. Besides, it also controls the blood pressure. It also removes fatigue and helps the sexual development.

The secretion created by adrenal glands, is called adrenalin. This secretion activates the limbs at the time of fear. A strange excitement is produced in the organs. The same action takes place at the time of sudden accidents or happenings. Consequently, with the secretion of juice the heart-beatings increase and muscles become strong and powerful. The man sweats and he is excited. During this time, the man's face becomes fierce and looking at his face it appears that either he is determined to give a fight or preparing for a fight.

Langerhans Islet Glands

Small divided cells in the pancreas are called langerhans islet glands. These glands produce insulin which by burning the starch helps the tissues in making it useful for the body. In the absence of sufficient quantity of insulin in the blood, the quantity of sugar increases which causes diabetes. Injection of insulin cures this disease.

Gonads

It has been already stated in the chapter on 'Reproductive System' that there is a difference between the reproductive glands of male and female. The reproductive glands in man are known as sperm glands, while the glands of woman are called ovaries. Besides producing semen and ovum respectively, these glands also produce a special type of juice that creates the distinguishing feature in male and female. This secretion is responsible for the hoarse voice, beard and moustaches in man and development of breasts and sweet voice in women. These glands affect the personality of human beings, because they are connected with the mental and physical development. If these glands are not active in a balanced proportion disorders appear in the body and the consequences are very severe. Proper treatment should immediately be started as soon as symptoms of any disorder appear.

SUMMARY

Those glands which have no canals emanating from them are called ductless glands. These are seven in number : (1) Pituitary glands, (2) Thyroid glands, (3) Parathyroid glands, (4) Thymus gland, (5) Adrenal, (6) Islets of langerhans, and (7) Gonads. The personality of a person depends on these glands. These glands are responsible for distinction between male and female.

EXERCISES

1. What do you understand by the ductless glands ? Write a short note on them.
2. Draw a sketch of ductless glands and explain their utility to the human body.

Chapter Fifteen

Nutritive And Balanced Diet

Nutritive and balanced diet provides the body with the required energy for doing every-day work. The food also makes good the energy lost in various activities. Besides, the responsibility of keeping the body temperature is that of the food. It is the food that helps the body to grow.

The quality and quantity of food taken by persons of different ages differ. That which is beneficial for children may prove harmful to adults. The variety of food needed for persons engaged in manual work differs from those doing mental work. Tissues in body continue to break during activities. The process through which tissues are formed is known as anabolism, while the process through which these are destroyed is called katabolism. The formation and destruction as tissues happen simultaneously. So the chemical reaction of the combined anabolism and katabolism is called metabolism. All the chemical reactions in the body produce heat.

Constituents of Diet

Different kinds of chemical substances are found in food. These are as follows :

Protein (vegetarian and non-vegetarian) : Tissues and muscles are produced by protein.

(1) Starch, (2) Fats, (3) Mineral salts and (4) Vitamins.

Protein

The substance formed by the combination of carbon, hydrogen, oxygen, nitrogen, sulphur and phosphorous is called protein. Protein is found in the shape of albumin in the egg, as myosin in meat, as

case in milk, as gluten in wheat and as legumin in various pulses and leafy vegetables. Ordinarily, the protein found in the vegetarian edibles is inferior to that found in non-vegetarian edibles or in other words protein derived from vegetation is inferior to that received from animals. The cells of animals are very much similar to those found in man, therefore, the protein derived from them is more useful. This is the reason why protein received from animals is comparatively superior.

Utility of Protein.

(1) The protein helps the formation of new tissues replacing those which are destroyed during exertion. It produces protoplasm. Because of this, protein is also called tissue producer. Protein is absolutely necessary for life. The growth of body is retarded in its absence and many diseases set in.

(2) When excessive protein is formed in the body it accumulates in the form of fat and produces heat and energy in the absence of carbohydrate.

(3) Protein produces in the body power to resist diseases.

(4) It helps in the production of digestive juices. It also helps the ductless glands to produce juices.

Carbohydrate

It combines in itself starch and sugar. Chemicals like carbon, hydrogen and oxygen are also found in it. This is essential for the formation of fat.

Starch is found in potatoes, rice, wheat, corn, millet, sago, etc. Sugar is found in sugar-canes, beet and different fruits. Lactose is found in milk. Starch is also found in some non-vegetarian diets, but the vegetarian diet is its main source.

Utility.

This is the main source of producing heat and energy. Muscles need it when a man puts in hard physical labour. The digestive system changes it into glucose which mixes in blood and reaches muscles and proves a very useful diet for them. The glucose in excess of body requirement collects in the liver in the shape of glycogen and when required again turns into glucose and supplies heat and energy to the muscles.

Fats

Carbon, hydrogen and oxygen are found in fats like carbo-

hydrates but the proportion of these chemical differ in them. Mixture of fatty acids and glycerine also exists in fats. Soap and glycerine are produced by the action of alkalies on the fat. The fat is divided into very small particles. The first action is called saponification and the other is called emulsification.

Utility.

This produces heat in the body and energy for muscles. It produces more heat and energy as compared to starch. Excessive fat in relation to body requirement is deposited below the skin in the body. Consequently, the body becomes healthy and the bones, joints and other body parts get protection against external injuries. Fat produces smoothness in the skin which minimises the loss of body albumin. The fat below the skin protects the body from outside heat and cold. Fat collects below the skin consequently the body becomes healthy, symmetrical and good looking. The bones, joints and other body parts become safe from external injuries. Fat also produces smoothness in the body which prevent the loss of albumin.

Fat is derived from two types of diets : (1) Non-vegetarian and (2) Vegetarian. Both produce heat and energy in equal proportion. The fat produced by non-vegetarian food has vitamin 'A' and 'D' as well.

Ordinarily, fat is found in butter, cheese, ghee, pig's fat, mustard, coconut and til oils.

Mineral Salts

Mineral salts have their value, for the health of the body. Calcium, iron, iodine, phosphate, sodium chloride, magnesium, sulphur and copper are important amongst the mineral salts. These fill up the twentieth part of the body. These contribute towards the general development of body and activate the digestive juices. The nerves, muscles and blood receive strength from them. These help in keeping the acids and alkalines in proper proportion.

Calcium

Calcium is found in good quantity in edibles—like milk, cheese, yolk, orange, fish and the green vegetables. It is needed most in the formation of teeth and bones. Tooth decay is the result of calcium deficiency. The growth of children is retarded and bone diseases appear when there is calcium deficiency in them. It controls the action of heart, blood and nerves. The muscles lose their

activeness during calcium deficiency in the body. Asthma and skin diseases appear and the nerves become excited in the absence of adequate quantity of calcium in the body. Vitamin 'D' is necessary for calcium.

Quantity of Calcium Daily Required

(1) Infants and babies	(1 year to 9 years)	1.0 gm
(2) Children	(10 year to 12 years)	1.2 gm
(3) Girls	(13 years to 15 years)	1.3 gm
(4) Boys	(13 years to 15 years)	1.4 gm
(5) Adults above	16 years	1.0 gm
(6) Expectant mothers		1.5 gm
(7) Women during Lactation Period		2.5 gm

Iron

Iron in body is produced by edibles like meal, eggs, carrots and green and leafy vegetables. Those two are, therefore, useful during anaemia. Iron is the main part of haemoglobin. This gives strength to blood corpuscles in carrying oxygen to the body parts. Lack of iron in the body causes anaemia. It is also useful for bile.

Iodine

Iodine is found in healthy food and some vegetables. It is also found in fish liver oil, water in some places and edibles got from sea.

It is useful for thyroid glands. Its deficiency retards the growth of body causing a serious disease called goitre. The brain also is not fully developed in its absence. Iodine is the most necessary constituents of the medicines prescribed for goitre.

Phosphate

Phosphate is found in meat, eggs, dry fruits, liver, milk and cheese. It is essential for the growth of teeth bones and nervous system. It is also useful for blood. Its deficiency retards the development of the body and teeth and bones become weak.

Sodium Chloride or Common Salt

This special type of salt is found in meat and milk. It can be mixed in the food separately. It is particularly useful for health. It is present throughout the body tissues and is the main source of the hydrochloric acid found in digestive juices.

Magnesium

Bones and teeth are formed by magnesium. It helps the carbohydrate to become useful for the body. Its deficiency like the calcium deficiency causes contraction of the muscles, of hands and legs. It functions as a digestive juice and expels the foul matter of the body through urinary passage. Magnesium is found in meat and vegetables.

Sulphur

Sulphur is also an important object that is needed for keeping the body healthy. This is an essential part of the body cells. It helps in the formation of brain, nails and hairs. Sulphur deficiency is the cause of falling hairs and nail decay. The hairs remain glossy as long as sulphur remains in good proportion in the body. It also helps in the digestion of food. It reaches the body in adequate quantity through eggs, beans, radish, spinach, pulse, cabbage etc.

Fibrous Edibles

Fibrous edibles are also necessary for the body. The muscles of intestines get some useful matter from the fibrous edibles which help in passing out stool because this matter helps in contraction and relaxation of muscles. These edibles keep the digestive system in order. Constipation is caused in the absence of fibrous edibles in the food. This matter is found in green vegetables, fruits, figs, meat and beet roots in sufficient quantities.

Vitamins

All the knowledge about the vitamins has been gained in the beginning of the twentieth century. Before this century, people had no knowledge about vitamins. It was in the year 1881 when an Englishman named Hopkins and two Americans experimented on rats and found out that the rats could not survive even when fat, protein, mineral salts and carbohydrates were given to them in proper proportion and quantity. In the year 1912, some important matter was discovered without which life was not possible. This matter was 'Vitamin'. These vitamins are known as life-giving matter. So far only six main varieties of vitamins have been discovered. They are named A, B, C, D, E, K. The vitamins can be divided into two categories :

(a) Water-soluble and (b) Fat-soluble.

Vitamin B and C belong to the water-soluble category while

vitamin A, D, C and K belong to the fat-soluble category. All of them are important from the health point of view. Each vitamin has a separate action on the body. These differ with each other. The vitamins are found in all the edibles. These are destroyed when cooked or kept for a long time. The vitamins found in vegetables are affected by time, place and circumstances.

Utility of Vitamins.

- (1) They produce disease resitant and destroying capacity.
- (2) They help in the proper growth of body.
- (3) They facilitate the digestive and nervous actions.
- (4) They help in producing healthy babies.
- (5) They help in making the carbohydrates and mineral salts useful for body.

(a) Water-Soluble Vitamins

Vitamin 'B'. It is a combination of hydrogen, oxygen, carbon and sulphur. It has ten different varieties and collectively it is known as vitamin complex. In these varieties, vitamin B¹ and vitamin B² are particularly useful for the human body. These are crystal-like and soluble. They continue to exist in heat but are destroyed in high temperature. These can exist in acids but are destroyed in alkalies. These varieties of vitamins are found in sufficient quantity in seeds, plants, the yolk of eggs, wheat, rice, many fruits, vegetables, beans, fresh peas and milk.

Vitamin B¹ after reaching the body gives the heart, liver, stomach, kidneys and both the intestines matter that is required for keeping them in a good state of health. Its deficiency thins the intestine membrane, consequently, it does not function smoothly. It causes indigestion, constipation and many other stomach ailments. The deficiency of vitamin B¹ is the cause for the heart weakness, accentricity, lack of concentration and headache. The dangerous disease of Beri-Beri is also caused by its deficiency. In this disease nerves get inflammation, muscles become useless and the hands are paralysed. The development of body is checked and it becomes weak. Heat is also affected. Abortion, bleeding, trembling of hands and feet, duodenal ulcers and inflammation etc. are also caused due to the deficiency of this vitamin. In its absence, the ends of lips turn white and crack. Ulcer on the tongue, inflammation of palate, and buccal mucous membrane appear. The skin becomes thick. Small boils appear on the body and sleep is seldom sound. Vitamin

(b) Fat-soluble Vitamins.

Vitamin 'A'. Vitamin 'A' is not destroyed by long exposure to sun-light or cooking. It also does not lose its properties when kept in sealed tins. This is the most important of the body. It particularly affects the eyes, lungs, intestines, skin and soft membranes in the body. It provides the body organs with the necessary diet. It increases appetite and helps digestive system to function properly. It increases the vitality and builds resistance capacity against diseases.

The deficiency of vitamin 'A' causes bronchitis, cold, cough, eye diseases, deafness and intestinal diseases. Its prolonged deficiency retards the growth of the body, because new cells are not formed. Inflammation of body parts appears due to anaemia. Secretion stops from nose, ears, mouth, stomach, etc., consequently, dryness appears in these body parts. This causes mucous membranes and the skin to crack. Its continued deficiency produces stones in the kidneys. Serious diseases like chronic catarrh, bronchitis, branchopneumonia, etc., are caused due to vitamin 'A' deficiency in the body.

Fish liver oils, green vegetables gram sprouts and leaves, cabbages, betel leaves, leafy vegetables, butter, milk, eggs, carrots, ripe tomatoes, millet and linseeds are rich in vitamin 'A'.

Vitamin D. This vitamin is found through two process :

- (a) By consuming things which are rich in this vitamin and
- (b) Through sun-light. The body receives vitamin 'D' from sun-light when rays fall on the skin.

Vitamin 'D' is found like vitamin 'A' in fish liver oils, black 'tils', milk, butter, cream and yolk. This is not found in adequate quantity in any vegetable. It is produced when ultra-violet rays fall on the human skin. When the sun-rays fall on the ergosterol which lies in the body below the skin it changes into vitamin 'D'. It is because of this action of sun-rays that children after oil massage are made to lie for sometime in sun-light. The deficiency of this vitamin in poor children is made good by sun-light. This vitamin increases in edibles when these are exposed to sun-light for sometime.

Vitamin 'D' is also called anti-rickets vitamin because calcium and phosphorous—the two things needed most of the development of bones and teeth—require this vitamin. In the absence of vitamin 'D', phosphorous and calcium go out of the body without performing their function and without being digested. Its deficiency in

children is most harmful because the proper development of bones and teeth takes place in this early age. In the absence of vitamin D the teeth of children cut late and not without trouble. Besides, the teeth are ill-shaped, either too close to each other or with abnormal gaps. Sometimes teeth appear to be over riding each other. Vitamin D is particularly needed in the diseases of rickets and soft bones. The bones become soft and easily bend on sides and delay in standing on legs in a child are symptoms of deficiency of vitamin 'D'. Diseases like small-pox, whooping cough, tuberculosis are likely to attack a person suffering from deficiency of this vitamin. The intake of this vitamin should be increased in children in order to cure bone and teeth diseases. They should be exposed to sunlight for long periods after oil massage.

Vitamin 'E'. This vitamin affects the reproductive power of the body and is called anti-sterility vitamin. Its deficiency renders person incapable of reproduction. Women, too, do not escape from its effect. Its deficiency causes the death of the body, abortions and miscarriages happen with the result that the woman loses her reproductive capacity.

Sprouts of wheat, yolk, dry, and fresh fruits and leafy vegetables are rich sources of this vitamin. Meat and milk are not rich in this respect. This vitamin has the power to bear heat.

Vitamin 'K'. It is soluble in fat. Its main function is to coagulate the blood. This vitamin is needed for coagulating the blood when bleeding starts due to injury. In the absence of this vitamin, blood does not coagulate. Vitamin 'K' produces prothrombin in the liver. The presence of this vitamin is essential in a woman during pre-natal and post-natal periods.

Vitamin 'K' is found in abundance in spinach, cabbages tomatoes, cauliflowers, potatoes, wheat, bran and yolk. Non-vegetarian diets are also rich in this respect.

Balanced Diet

It is necessary to pay attention to the following in respect of balanced diet :

- (1) The human diet should contain all the essential ingredients like protein, fat, mineral salts, carbohydrates, vitamins, fibrous edibles and water.
- (2) All the described things in the preceding pages should be

present in an adequate proportion. These should be neither in excess nor in smaller quantities. Everyone should eat these things according to his age, sex and profession. He should also take into consideration the climatic conditions.

- (3) Food should be light and easily digestible.
- (4) The food should be served in a manner that one should automatically be attracted towards it. Food which is not tasteful and served in a bad manner does not stimulate the appetite. Consequently, one does not take it in the required quantity and the pleasant way in which it is served also has its adverse effect on the digestive system. As a result of this it is not properly digested. The same menu should not be repeated everyday. It does not create interest in the food. The food which is not eaten with interest tells adversely on the digestive system inasmuch as it does not help in producing reasonable quantity of gastric juices as the result of which constipation is caused.
- (5) Carelessness while preparing food and carrying it from place to place causes many defects in the food. Dust and flies, too, spoil food. Consequently, it becomes harmful, when exposed to these. Stale food turns poisonous. This kind of food should not be taken in any circumstance.

The above factors should be kept in view while preparing food. The diet of a normal and healthy individual should consist of edibles in the following proportion :

Balanced Diet of a Normal and Healthy Person

Bread	15 oz
Milk	16 oz
Potatoes and other vegetables	40 oz
Meat	6 oz
Butter	1 oz
Cereal	2 oz
Sugar	1-1/2 oz
Fruits	4 oz
Liquids	3 pints

Changes should be made in the above list according to the profession, body built, sex, age and climatic conditions.

Profession.

Those persons who are engaged in manual work need larger quantity of food as compared to those who do lighter work. Persons engaged in mental work need less carbohydrates but more protein. They should take food rich in protein.

Body Built.

At all and fat person needs more food as compared to a lean and thin person with short stature. This is because more heat is lost in the person belonging to the first category as compared to the lean and thin one with short stature.

Sex.

Women need less food as compared to men because of short stature and less body weight. They also put in less physical labour as compared to men.

Age.

The quantity of food also depends on the age factor. Children need more food for their body development. They need larger quantities of fat and protein.

Less quantity of food should be taken by old persons. In old age, one does not required enough food. The digestive system, too, becomes weak. Eating more food, therefore, proves harmful in old age.

Climatic Condition.

Climatic condition also affects the quantity of food. Persons living in colder regions need more food than those living in hotter regions. For keeping up their body-heat, the people of colder place need food rich in proteins and fats. More hunger is felt during winter than in rainy season and as such, we need more heat during winter. Not only this, we need such food that produces more heat during winter. On the contrary, food producing cooling effect is needed during summer. Changes should be made in the food in view of the above condition.

Malnutrition

The following are the causes of malnutrition :

- (a) Malnutrition is caused due to lack of sufficient balanced diet.

- (b) Circumstances also cause malnutrition. Nutritious, under adverse circumstances, do not do good to the body and their food value is lost.
- (c) Defective food is another cause of malnutrition. Despite favourable atmosphere and circumstances this kind of diet proves harmful.

Causes of Malnutrition

(1) **Defective Atmosphere.** Among the causes of malnutrition come lack of fresh air, sun-light and physical exercise. Unhealthy situation of school buildings, obstruction in the way of fresh air and big gatherings are also contributory factors.

(2) **Overwork.** Overwork needs more food and the average intake of edibles generally prove insufficient to meet the greater demand of food. It adversely affects the health. Covering the long distance of school on foot and not getting appropriate diet proves harmful to the body. Foul and dirty atmosphere and circumstances also cause bad health.

(3) **Chronic Ill-Health.** Long illness reduces the vitality to such an extent that the body finds itself unable to utilise all that is eaten.

(4) **Lack of Sleep.** A man does not get sound sleep in the absence of fresh air and proper sleeping arrangements. Overwork and noisy surroundings also disturb the sleep which proves harmful for health.

(5) **Lack of Sufficient and Proper Food.** As has been stated above, the food requirements of individuals differ according to age and nature of profession. When a person does not get proper food according to his age and nature of work and if this state of affairs persists for a long period, his health is adversely affected, and malnutrition is caused.

The development of body is checked in the absence of nourishing and balanced diet and one grows weak. This weakness may be caused by two factors. Either it is due to the lack of sufficient quantity of food or the lack of those things in the food that are necessary for the maintenance and development of body.

(6) **Improper Food.** Obstructions are created in the way of the natural development of body due to improper food. It has been

generally observed that some persons eat things that are hard to digest. Consequently, they fall victims to indigestion and become ill.

Symptoms of Malnutrition

Those children who fail to get nourishing and balanced diet become weak, lean, thin and short-statured. Their face turns yellow, eyelids appear to be heavy and eyes give a dull expression. Lack of fat loosens the skin and wrinkles are formed on the body as well. The hairs lose their glossiness and become dry. Such children cut their teeth late and the teeth are generally defective. These children always face the risk of falling victims to rickets and other diseases. They do not get sound sleep and wake up many a time during sleep. They suffer from restlessness. They lack in concentration. They easily catch infections and are generally seen suffering from cold and cough.

The first thing to be done for improving health is to find out the causes responsible for bad health.

It is the duty of every teacher to find out such students who do not get nutritive and balanced diet. They should invite the attention of the parents, school physician and nurse towards such students and get proper arrangement of food made. It is also the responsibility and the duty of the government to provide nutritive food to such children.

SUMMARY

Protein, starch, fat, mineral salts and vitamins are the ingredients of food. Protein consists of carbon, hydrogen, oxygen, nitrogen, sulphur and phosphorous. It has the quality of forming tissues and producing heat and energy. Starch is needed most for producing fat. Carbohydrate is the mixture of fatty acids and glycerine. These are the essential constituents which must be present in food for good health.

Vitamins of two varieties : (i) Water-soluble and (ii) Fat-soluble. These are named A, B, C, D, E and K. These are absolutely necessary for health.

The man needs nutritive and balanced diet for good health. Food should be taken according to age, sex, profession and climatic

conditions. Malnutrition is caused by insufficient food, adverse circumstances and defective food.

EXERCISES

1. What do you know about the essential constituents of food ? Write a short note on them.
2. What is the utility of protein for the body ? Discuss in brief.
3. What do you know about vitamins ?
4. What is meant by balanced diet ? What are its effect on the body ?

Chapter Sixteen

Air And Sun Light

Air is as essential for life as food. Life is impossible without air. It is through air that we get oxygen which purifies our blood. The food, too, becomes useful for the body by the action of air which in turn makes the body function efficient and ensures its proper development.

The air is a gift from nature. The following gases are present in the fresh air :

Oxygen	—	20·96%
Nitrogen	—	79·00%
Carbon di-oxide	—	00·04%

Besides the above gases, water vapours, ammonia, organic matter, ozone, oxides of nitrogen, etc., are also present.

There is a difference between the fresh air that we inhale and the foul air which we exhale. The oxygen gas is not present in the air which we throw out of the lungs. The proportion of carbon dioxide increases by three to four per cent. Besides carbon, monoxide and oxide of sulphuric gases are also present in it. The proportion of gases in the discharged air is in the following manner :

Oxygen	—	16·50%
Nitrogen	—	79·00%
Carbon di-oxide	—	4·50%

The foul air adversely affects the body development. It produces physical and mental fatigue, restlessness, worry, headache, sleep and heaviness. The heart-beats become slow causing disturbance in

the normal respiration. The mind becomes restless with the result that one cannot concentrate on anything. One experiences a lack of appetite. He also feels physical weakness. In these circumstances, there is a likelihood of his getting anaemic.

Science has proved that the condition of physical environment is more important for the healthy development of the body than the chemical proportion of the air. The physical environments affect our health. These are as under :

(a) High temperature, (b) excessive dampness in the air, (c) standstill air, (d) infectious germs in the air.

The normal temperature of our body should remain at 98.4°F, while that of the living rooms should be between 55°F to 60°F. In this condition, our body maintains a higher temperature than that of the room and heat is produced all the time in the body. This heat warms up the air touching our skin and continuously escape from our body after drying up the sweat. Obstructions arise in the smooth functioning when the outside air becomes too hot. In this condition, the body heat does not remain in a position to warm the air touching the skin because the difference between the temperature of skin and outside air is considerably less. Consequently, it happens that the air does not rise up after getting warm and the fresh air cannot replace it.

The body can remain in a healthy state if the air in the room circulates. Artificial devices can be used for keeping the air in motion, cool and dry to a reasonable extent. Keeping down the temperature of the air, reducing its dampness and maintaining its circulation will keep the respiratory process in a good order. Consequently, the foul air discharged from the lungs will not adversely affect the body. By making provision of cross ventilation of air, the risk of infections is reduced. Cross ventilation arrangement in a room is absolutely necessary for obtaining fresh air and dispelling the foul air. The numbers of doors and windows in the rooms should, therefore, be as many as possible. This will facilitate the throwing out of foul air from the room and the infectious germs will thus be destroyed. The result would be that children will not fall victim to diseases easily and will remain healthy.

The sole aim of artificial devices is to dispel the foul air and let the fresh air enter the room. The devices are of two categories : (i) Natural and (ii) Artificial. Ventilation of air without the aid of

any artificial device is called natural ventilation of air. Natural ventilation is more beneficial than the artificial one. The natural ventilation depends on the ventilation of gases, air action and convection currents.

Ventilation

When two gases meet each other, they mix up. So the outer air mixes with the room air on opening the doors and windows. In this way the good qualities of the outside air come in the room and the inside air becomes fresh. The room air continuously turns fresh through this action but it is a very slow process, as such it has no importance.

Air Action.

The air takes away with itself the foul matter gases from the room and passages. The fresh air enters the room from one end and displaces the foul air which escapes from the other end when all the doors and windows are open. Not only this, but as soon as the foul air rises up and escapes through an outlet, fresh air immediately rushes in and takes its place producing a kind of wave. In this way, the air invisibly plays the role of a mechanical device.

Convention Currents.

The movement of hot air upwards and the cold air downwards is called the action of convection currents. This action or movement is possible because the hot waves are lighter and rise upwards while the cooler air that replaces it is comparatively heavier. Sufficient doors and windows are necessary for smooth action so that foul air is displaced by the fresh air, and the hotter air by cooler air.

There are four natural ventilation devices: (1) Chimney or ventilators. (2) Doors and windows. (3) Openings at or near the floor level with vertical shafts. (4) Exits or outlets in the roofs or walls.

Chimney.

This is a suitable device of dispelling the foul air. The hot air rushes out through it speedily. Fresh air enters from other inlets to take the place of the dispelled air. (See Fig. No. 40)

Doors and Windows.

In colder countries, the number of doors and windows in houses are comparatively fewer than the houses in hotter countries. In colder countries, it is harmful as well as troublesome to have a large number of doors and windows, but in hotter countries the lar-

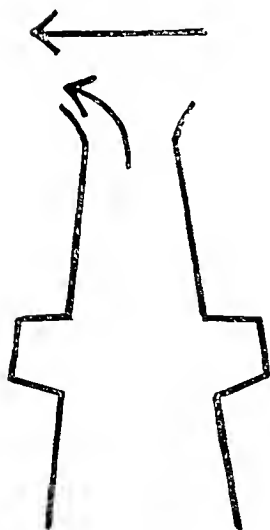


Fig. No. 40 **Aspiration through a Chimney**

ger the number of doors and windows the more comfortable and useful the houses are.

Tobin's Tubes.

The air under this system enters the room through a six feet high tube in the wall from the air inlet nearest to the floor.

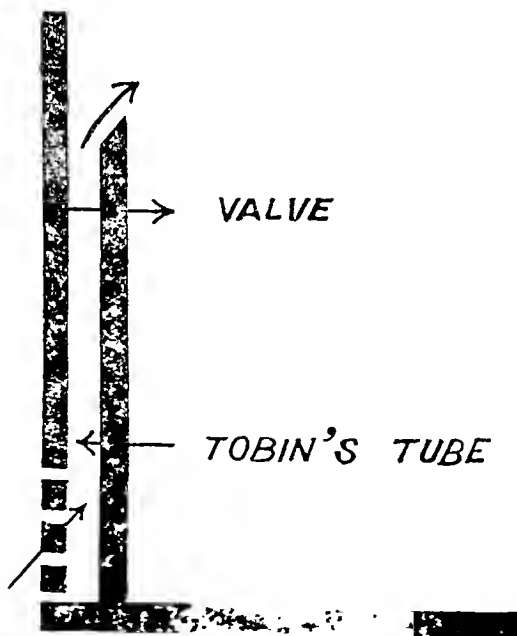


Fig. No. 41 **Tobin's tube**

If a valve is fixed at the higher end, the inflow of the air in the room can be controlled.

Wall or Ceilling Air Passage.

Many kinds of air passages can be built in the roofs of single-stories buildings through which fresh air may enter and the foul air may go out. Machinell air passages are very useful in this respect. In this system, there are two passages. Through the inner passage, the air goes out and fresh air enters through the outer passage.

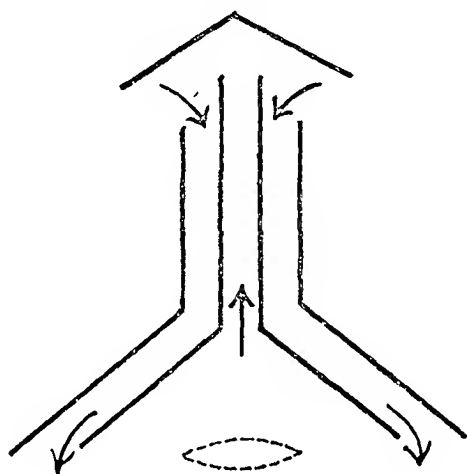


Fig. No. 42 Machinell Air Passage

Sun-Light

Life is an impossibility without sun-light. The sun-light is equally essential for animals, birds and plants. The sun-light besides life-giving properties also possess the qualities of destroying harmful germs. It also adds strength to the human skin's power of killing germs. The white corpuscles of blood derive power from sun-light as the result of which it saves the body from falling ill. It increases the health-giving products like iron, calcium, phosphorous, iodine etc., in the blood. The sun-light is also helpful to the digestive and blood circulatory systems. Vitamin 'D' which is so necessary for bones and teeth is produced in the body by sun-light. It also cures rickets. It helps in curing the serious diseases like reumatism and tuberculosis. It will thus be seen that sun-light is very necessary for life.

Children suffer from anaemia due to lack of sun-light. The school buildings should, therefore, be so constructed that sufficient light may be available to the students. The sun-light proves very effective in the treatment of diseases like inflammation of tuberculosis glands (neck glands), leprosy, tuberculosis, etc. The deficiencies caused by unbalanced diet is also made good to some extent by the sun-light. It helps in the early recovery of health after illness. The sun-light should, therefore, be put to maximum use. The children should play and take exercise in places where fresh air and sun-light are in abundance.

SUMMARY

The quantity of oxygen is less in the air that is exhaled by lungs. Foul air adversely affects the health. It is harmful for body. The physical environments are of more importance than the chemical properties or proportion of air.

Our body is harmed by high temperature of the air, its stiltiness or its lack of circulation and greater number of germs in it.

There are natural and artificial methods of propelling the air inside the room, or dispelling it out. The natural process is based on cross ventilation, air action and convection currents. It needs four special equipments : (1) Chimney, (2) Doors and windows, (3) Tobin's tubes and (4) The Air passages in roofs or walls.

Under the artificial process the system of vacuum and propulsion methods are included. These systems are defective and costly.

The sun-light is absolutely essential for life. It kills the germs. Lack of sun-light causes a number of diseases.

EXERCISES

1. What is the difference between the air that we inhale and that which we exhale ? Which of the two adversely affects the body ?
2. Write a short note on the many devices used for keeping the air fresh in the room.

Chapter Seventeen

Bodily Posture of Students

Bodily posture means the balancing of body in a proper manner while sitting, standing, reading or writing or during any other body action. In a proper posture, the whole body weight falls on the two legs without any effort and the entire body appears a vertical line. In this state, all the limbs perform their functions and do not tire easily. Proper body posture indicates a healthy and strong body, while improper faulty postures represent a sick and weak body. The proper posture also reveals a sound mind. Self-confidence, happiness and determination are the results of correct posture and on the contrary anxiety, unhappiness and pessimism are the outcome of wrong posture.

The child should possess from the early days the knowledge of correct posture of standing, sitting and reading. In the absence of this knowledge, he adopts faulty postures as the results of which the backbone bends, the chest becomes like a pigeon-chest, the shoulders turn dropping, feet become flat, vision turns defective and many other deformities appear in the body. There are two reasons for faulty postures. One relates to home and the other to the school.

Home Causes

1. In the absence of nourishing and balanced diet, the bones and muscles of the child become weak and they tire in a short period. Consequently, the child adopts faulty postures.
2. Lack of fresh air, sufficient light, rest and sleep help developing wrong postures.

3. Improper physical exercise and dirty habits are also responsible for wrong postures.
4. Taking it a fashion, the children adopt faulty postures and bring artificiality in their natural postures.
5. Dresses are also responsible for producing ill effects on the children and they develop wrong postures.

School Causes

1. In many schools the shape and size of desks and chairs are uniform as the result of which the students with different physical standards cannot sit comfortably on them. Consequently, they occupy wrong positions while reading and writing and they develop the habit of sitting in faulty postures.
2. Lack of attention in school towards the fatigue and recreation of students develop in them faulty sitting habits.
3. Overlooking the habit of faulty postures also creates this defect.
4. Carrying the load of books continuously on one shoulder also influences the posture.
5. Children have to bend their body for seeing and listening to their mistakes. They have also to bend the body when defects appear in their vision. Consequently, they develop wrong postures.
6. Continuously doing the same work, tries the brain of the child. He, therefore, wants to relax by changing the body position. In these circumstances also some posture defect may arise.

Methods for Removing Posture Defects

Attention should be paid on the following things for removing the defects of faulty posture :

1. The children get nourishing and balanced diet so that they may develop enough strength to stand, sit or read for a long time in the same position.
2. Arrangement for suitable living accommodation should be made so that fresh air and sufficient light may be available in abundance.

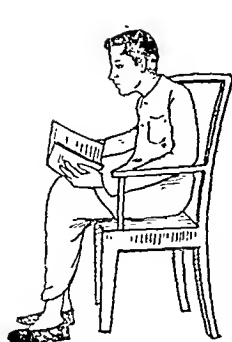
3. They should be given opportunity for suitable physical exercise and of developing clean habits.
4. The dresses of children should not be very tight. They should be such that physical development may not be hampered.
5. The desks and chairs should be so constructed as to give maximum comfort to the child.
6. The children should be told the necessary things about the body posture and whenever they default, they should be cautioned or warned.
7. Even if the desks and chairs are suitably made the children should not be allowed to sit for long in one position. Changes in the sitting positions should be made at regular intervals.
8. Children should be made to undertake such physical exercise that may help in removing the defects caused by faulty postures.
9. Children should be advised to go to hospitals for the treatment of complicated deformities.

The foregoing account makes it clear as to important are the body postures for the physical and mental development of the children. Attention towards it should therefore, be paid since the very beginning. It is very necessary that the reading, writing and standing positions of students should be carefully watched.

Proper Posture at the Time of Reading

The children should sit in an upright position while reading. The book should be placed at a distance of at least twelve inches from the eyes. Myopia develops if the book is placed very near the eyes. An angle of 45° should be formed between the eyes and the hand holding the book. For keeping the head erect, the book should be placed much below. Very young children should be given books of bold prints. The vision becomes defective when books with small prints are read.

If adequate attention is not paid to the above, defects will arise in the sight, chest will become narrow and the bones in the backbone will become deformed.

**Fig. No. 43**

**The correct Posture
while reading.**

**Fig. No. 44**

**Wrong Posture
while Reading.**

Attention should be paid on the following while wrong :

- (a) The way of holding the pen.
- (b) Position of the paper.
- (c) The method of writing, and
- (d) Form of hand-writing.

**Fig. No. 45** **Wrong posture**

The child should balance and keep his body in an upright position before starting writing. The chair should be pulled nearer the desks, the thighs kept straight and the lower limbs placed in a vertical position. The legs should rest on the ground and the left hand should keep the papers in order. This helps in writing and the hand does not remain idle.

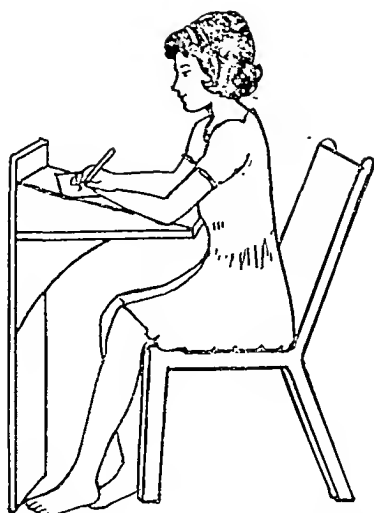


Fig. No. 46 (a) Right Method of Holding the Pen

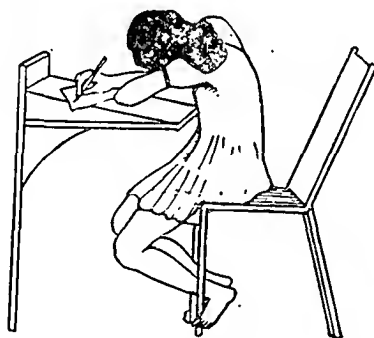


Fig. No. 46 (b) Wrong Method of Holding the Pen

The forearm should be rested on the elbow in a manner so that palm may remain continuously visible. The pen should be held by the thumb and the two fingers nearer it and the upper end of the pen should remain between the thumb and the finger adjoining it.

Position of the Paper

The paper while writing should remain parallel to the edge of the desk. In this way, the hand-writing will be upright and the words also will be legible, regular and attractive. The body limbs, too, will remain in this manner at their proper place and function

efficiently. By so doing, deformities will not appear in the body parts.

Teaching Writing

In order to teach writing, the use of black wooden slate should be made first of all. Letters should be taught first and the words should follow next. It is always beneficial to write on the black wooden slate with a broad pointed wooden pen. A broad pointed pen should be made of reeds and the point should be bisected. The entire wooden blackboard should be lined and letters and words be written in between the lines. This helps the children in developing a good and beautiful hand-writing. The words thus written are regular and beautiful. This practice of writing on black wooden boards is gradually vanishing these days. Consequently, the hand-writing of people, too, is losing attraction. The student after doing sufficient practice on the wooden black-board, should switch over to slates. Writing on paper with ink should start in the fourth year. The old saying killing two birds with one stone, will thus be proved, *i.e.*, the hand-writing of the child will become beautiful and expenses on ink and stationery will also be minimised.

Method of Writing

Children when sit in a wrong posture while writing, write slantingly and the lines are not straight. Slanting hand-writing never looks attractive. In this kind of hand-writing the paper does not remain parallel to the edge of the desk. The head bends towards left side and the right shoulder gets raised. The eyes, too, do not remain at an distance from the paper and the backbone also bends. The muscles and nerves are more strained in this posture of writing and they tire out in a short time.

The child should be encouraged to write in an upright manner, because he easily learns thus the method of writing. His sitting posture remains in the correct position and the paper being equi-distant from both the eyes, writing does not unnecessarily strain the eyes. He can sit upright on the chair and write with paper remaining parallel to the desk. No part of the body in this way is strained. He does not tire out easily.

Correct Sitting Posture

The correct sitting posture can be recognised by the following :

1. The hips region should be properly placed at the sitting place.

2. The head, shoulders and hips should be in a straight line.
3. Vertebral column should be straight.
4. Head should be upright so that the muscles behind may get some rest.
5. Both arms should be balanced.
6. Thighs should be straight.
7. Legs should be vertically resting on the feet.

It is very harmful to sit with a bent vertebral column. This causes extra strain on the connected limbs which tire out in a short period. Consequently, obstructions are caused in their functioning.

Correct Posture while Standing

In the correct standing position, the body weight falls on both the legs equally. The heels should rest on the flat surface correctly and no muscle should be strained. In this position, the waist and the head should be straight, chest should bulge a little forward and the two shoulders should be in a straight line. The two arms should also rest on the thighs in a straight line. This position of attention should be adopted for a short time because the two legs tire out simultaneously due to the body weight falling on them equally. It is advisable to stretch a leg forward in case one is required to stand for a longer time, because in so doing, the body weight will fall on the back leg and the front leg will get an opportunity for rest. The position of the leg may be changed when the back leg feels tired. In this way, both the legs rest in turn. This position is called the standing position at ease.

Defects Relating to Posture

If the school-going children are examined in relation to body postures, at least fifty per cent of them will be found adopting faulty postures in some way or other. These defects are of the following category :

Spinal Curvature.

This defect is generally found in a large number of children. Excessive strain during childhood on the vertebral column makes it curve and the following defects arise :

- (1) Appearance of Kyphosis
- (2) Lordosis
- (3) Scoliosis



Fig. No. 47
Correct Position of Standing.



Fig. No. 48
Faulty Position of Standing.



Fig. No. 49
The Correct Position of
legs while standing, for a
long period side position.



Fig. No. 50
The Correct Position of legs
while standing of a long
period back position.

Kyphosis

The following deformities appear with the Kyphosis :

- (1) Bending of head and body in the forward direction,
- (2) Round back,
- (3) Flat chest,
- (4) Round shoulders,
- (5) Round hollow back,
- (6) Bulging out of the belly,

The above mentioned defects are caused by unnutritive and unbalanced diet, lack of fresh air and inadequate physical exercises. Besides, faulty desk sitting posture, myopia, excessive strain on shoulders, and rickets also deform the waist region. The teacher, in order to remove these defects, should impress upon the students the importance of adopting correct postures while standing, reading and writing. Boys with deformities should be advised to take proper physical exercises cure these diseases.



Fig. No. 51
Spinal Curvature

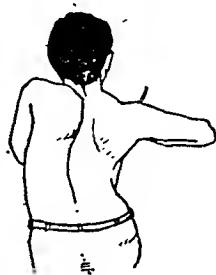


Fig. No. 52

Lordosis

The defect causes the back to bend in either direction. Curvature also appears in the waist region. The shoulder bones in the back also seem to be bending towards the sides. Hips also bulge out. In this state of body, occasionally the child experiences pain in the back and walks like a lame person.

This defect is caused by the under-development of legs, disease of bone-joints, dislocation of hips or infantile paralysis. Faulty standing posture, too, causes this defect. In this condition the body lets the body weight fall on one leg. Consequently, the vertebral column takes the shape of the English letter 'C'. The habit of standing on one leg also causes this defect.

For removing this defect, the child should be made to stand in the correct posture. Special physical exercise, too, cure this defects. In severe and complicated cases, proper treatment should be undertaken on the expert advise of a doctor.

Flat Foot

This defect is found in the early years in weak children. This is

caused by over work and by putting on heavy shoes. This weakens the bony bonds which keep, the foot muscles and the foot bridge in order. Consequently, the foot becomes flat. Continuously standing or walking also tires out the muscles as the result of which these muscles find themselves unable to function properly and the foot turns flat.

The foot should be rested as soon as symptoms of this defect appear. They should be saved from fatigue. This defect is also overcome by walking on toes. It is also useful to apply pressure on the edges of sole while walking.

SUMMARY

Correct body posture represents a healthy and strong body. Faulty posture, on the other hand, mean a weak and sick body. There are two causes of faulty postures : (1) Relating to home and (2) Relating to school. Many deformities in the body appear due to faulty postures adopted while standing; sitting, reading or writing e. g., spinal curvature, flat foot, etc.

The students while reading a book, should sit in an upright position and keep the book at a distance of at least twelve inches from the eye. An angle of 45° should be formed while reading a book in hand.

Special attention should be paid to the manner of holding the paper position, the hand-writing and the way of writing.

The head, shoulders and the hips should form a straight line while sitting. Vertebral column should also be straight.

The body weight should fall equally on both the legs while standing for a short time, but for a longer duration, the body weight should fall alternately on legs, *i. e.*, one leg should remain stretched forward.

EXERCISES

1. What are the causes of wrong body postures ? Give a detailed account.
2. Describe with the help of a sketch, the correct posture while writing.
3. What deformities are caused by wrong postures ? How can they be overcome ?

Chapter Eighteen

Ordinary Accidents And Their First Aid

Sometimes, accidents like fracture of bones, injuries, burn, sprain etc., occur in schools while the students are playing, doing wood-work, taking exercise or making experiments in laboratory. The teacher should possess knowledge of these every-day accidents and render immediate first aid relief. The teacher should not only have knowledge of the above but should be efficient in this job of rendering first aid. Students involved in serious accidents should be sent to the medical doctor for proper treatment.

Bone Fracture

The causes of bone fractures of children may be many. Fracture along with the external wound is called compound fracture but when there is no external wound, the condition is called simple fracture. Sometimes, complications arise when the simple fracture is neglected and proper treatment is not provided. Occasionally, bone fracture happens along with the internal injury. This condition is called complicated fracture. The bones of children are soft as compared to an adult's bone and easily bend aside. This condition is called green-strick fracture. The bone in this type of fracture bends like a green twig of a tree. Serious injury sometimes breaks the bone in many parts and splinters scatter. This kind of bone fracture is called comminuted fracture.

Symptoms.

During fracture, the affected part gets swollen, severe pain is felt in moving the affected part, chattering sound is produced by the friction of one bone part against the other, and the larger bones become shorter.

Treatment.

(1) Great care has to be taken in the treatment of fractures so that the trouble might not increase.

(2) Fracture should be treated as far as possible on the spot. The situation can worsen if the patient is removed from one place to another, because it involves the movement of the patient.

(3) The patient should not be allowed to move unless the broken bone has been set. If this care is not taken, complications may arise later.

(4) If during the fracture bleeding also starts, attempts should be made first to stop the bleeding. In extraordinary situation, the wound should be cleaned with water and germicidal soap and bandage with soft pad be tied over it.

(5) For setting the broken bones and bringing them in the normal position, splinters and bandages should be used. The splinter should be tied by bandages by applying reef-knots so that the broken bones may not be displaced.

(6) The patient should be kept warm toward off the effect of shock.

(7) The injured should be laid on a stretcher and carried to the doctor for further treatment and advice.

Sprain

Every joint remains in its position as it is bound to ligament fibrous bonds. These joints bonds sometimes either get broken or stretched during a sudden jerk. This condition is called sprain.

Symptoms.

- (1) The joints lose their power of movement.
- (2) Inflammation appears on the affected part.
- (3) Severe pain is experienced in that part.
- (4) The colour of the skin changes.

Treatment.

- (1) The affected parts should be given complete rest and movements should be stopped for some days.
- (2) The affected part should be thoroughly massaged with mustard oil.
- (3) The affected part should be tightly bandaged and put in ice-water. Use of opium also gives relief.

- (4) If the above treatments do not relieve pain, the sprained part should be washed with hot water. This is likely to reduce the pain.
- (5) The affected part should be tightly bandaged with a water-soaked bandage. This fully tightens the affected part. The affected part should not be used for work.

Dislocation of Bones

The displacement of a bone from its joint is called the dislocation of bone. Generally knee, elbow, shoulder, lower jaw or feet bones get dislocated.

Symptoms.

- (1) Dislocation of bone causes severe pain.
- (2) The affected part gets swollen.
- (3) The affected part loses its power of functioning.
- (4) The part is deformed.
- (5) The part becomes motionless.

Treatment.

- (1) This part should be tightened with a cold water-soaked bandage.
- (2) If the cold water-soaked bandage does not relieve the pain, the affected part should be fomented.
- (3) If even the fomentation does not prove of any use in relieving the pain, a doctor should be consulted.

Bleeding

Injury to blood vessels causes bleeding. Before attempting to stop bleeding, it is necessary to know which kind of the blood vessel is bleeding, whether it is an artery, vein or capillary. A knowledge of various types of blood vessels helps in the treatment of stopping bleeding.

Symptoms of Capillary Bleeding.

Blood flows slowly from a capillary. This is an ordinary bleeding.

Treatment.

To stop the capillary bleeding, the affected part should be put into cold water or a water-soaked pad should be put on the bleeding spot and tied with a bandage. This should be dipped into cold water.

Symptoms of Venous Bleeding.

- (1) The bleeding part should be raised upwards and a pressure should be applied below.
- (2) A tourniquet should be tied below the bleeding part.
- (3) A water-soaked clean pad should be put on the affected part and a bandage tightened around it.
- (4) The injured hand or leg should be suspended downwards.

Symptoms of Arterial Bleeding.

- (1) The blood spurts out like the beating of heart.
- (2) It is deep-red.
- (3) It is very bright too.
- (4) This blood always flow in the opposite direction of the heart. If the bigger artery of hand or feet is cut, the man dies in a minute and a half.

Treatment.

Bleeding from the artery is a very serious matter. Immediate efforts should be made to stop it. It is not an ordinary matter to stop arterial bleeding. For stopping the bleeding, pressure through a cloth should be applied over the wound. Mostly the bleeding stops with this action.

If the bleeding does not stop by the above treatment, the thumb pressure should be applied at the nearest pressure point about the heart. There are 13 such pressure points in the body. This has earlier been discussed in the preceding pages.

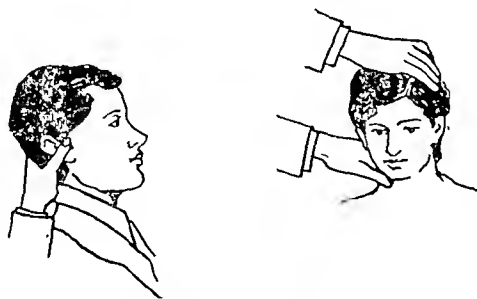


Fig. No. 53 Stopping Blood with Thumb Pressure at Pressure Points.

Besides, the bleeding may also be stopped by applying tourniquets. Raising the bleeding part upwards also does good because

much of the blood goes back and only a little comes out. Doctor's consultation is very necessary in this case, because applying pressure for a long period affects adversely the nerves. A stimulating beverage should be given to the injured person only after the bleeding stops.

Nose Bleeding.

An injury caused to the nose or the appearance of a boil causes rupture of blood capillaries of the nose. Consequently, bleeding starts. Sometimes, strong sneeze also injures the blood capillaries with the result that bleeding starts.

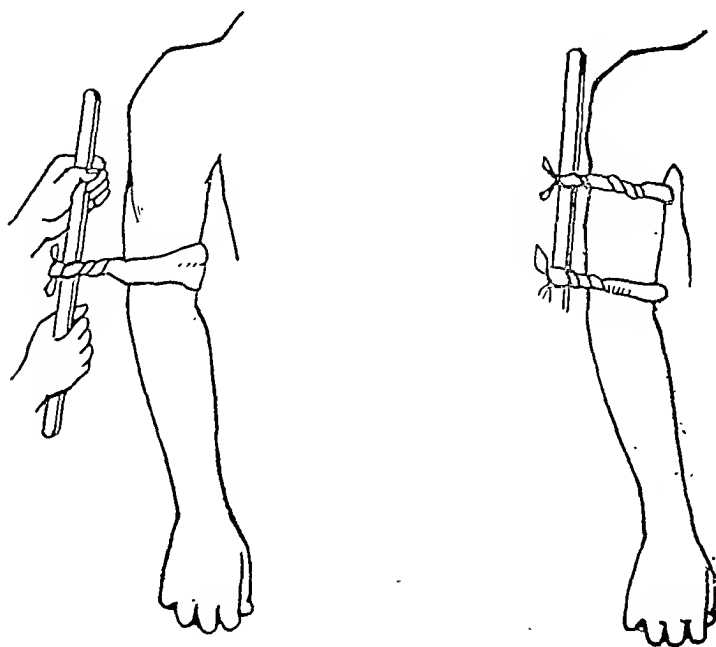


Fig. No. 54 Applying Tourniquet

Treatment.

Children bleeding from the nose should be made to sit on a chair with head hanging backward. They should sit in the direction of blowing air. Raising of both hands above the head also helps. By so doing, the flow of blood towards head slows down. The clothes on the neck should be loosened, and a cold water-soaked pad of clean cloth should be placed behind the neck or on the nose bone.

The feet of the patient should be placed in hot water. He should neither be allowed to sneeze nor breathe through mouth. Alum solution in cold water may also be used. If these treatments fail, a doctor should immediately be consulted and treatment should be given accordingly.

Wounds

Wound is caused when body nerves break down and cause bleeding. Disease spreading germs and other poisonous matters enter the body through wounds.

Treatment.

The first aid rendered to a wound has two objects : (1) Stoppage of bleeding and (2) Stopping the poisonous matter to enter the body.

(1) The treatment for stopping bleeding as described above, should be attempted for stopping the flow of blood from a wound.

(2) The coagulated blood on the wound should not be disturbed as a precaution against contagion.

(3) The wound should be cleaned with lukewarm water in order to remove the dirt etc. The wound should then be allowed to dry for sometime. When it dries, a gauze dipped in tincture iodine or spirit should be placed on the wound.

(4) A bandage should be tightened over the wound when a gauze dipped in tincture iodine or spirit has been placed over it after it has been cleaned with clean and warm water. This protects the wound for germs. A gauze or a pad is most suitable for this purpose.

Bruises

An injury, pressure or a fall causes the blood vessels beneath the skin to break as the result of which the injured part turns blue.

Symptoms.

Pain is felt in the spot that has turned blue. Its colour also changes and it swells.

Treatment.

(1) A cloth soaked in ice-cold water applied to the injured place gives relief.

(2) Fomentation is also beneficial.

(3) The injured part should be given sufficient rest.

Insect Stings or Bites

Wounds are sometimes caused through an insect sting or bite. Although only a little bleeding takes place, but there is a likelihood of poison spreading in the body.

Treatment.

(1) Sometimes, the sting is left at the place where the insect strikes. The sting should be taken out with the help of a forcep or a disinfected needle and blood allowed to flow for sometime. Later on, the wound should be cleaned with clean warm water and soap and mercury iodine applied over it.

(2) Applying ammonia, spirit or a strong solution of soda bicarbonate at the affected part also reduces pain.

Unconsciousness

A man turns unconsciousness due to the following reasons :

- (1) Effect of some poison,
- (2) Sun-stroke or heat-stroke,
- (3) Too much bleeding from the head,
- (4) Serious mental shock due to injury on head,
- (5) Hurt, and
- (6) Hysteria, epilepsy of unconsciousness caused by profuse bleeding.

Poison

Although there exist a number of poisonous matters in the world, but from the first aid point of view these are divided into two categories : In one category fall those which burn the body tissues and are called corrosive poisons. The second category is of those poisons that do not burn the tissues. These are called non-corrosive poisons.

In both the cases of poisoning a physician should immediately be contacted and should be informed of the category of poison. The patient should not be allowed to sleep. Different poisons need different treatment.

Non-corrosive Poisons.

These poisons do not burn the lips or mouth or any other part of the body. The patient should, therefore, be made to vomit

in these poisoning cases. The following methods should be used for vomiting :

(1) Two spoonful of salt mixed in a glass of cold water taken by the patient enables him to vomit.

(2) A spoonful of powdered mustard seeds mixed in a glass of water taken by the patient also enable him to vomit.

(3) The above described two processes should be repeated every five minutes till vomiting starts.

(4) Vomiting also starts when fingers are put into throat.

(5) The vomited substance should be kept for chemical examination.

(6) A drink having cooling effect should be given to the patient after vomiting.

Sun-stroke or Heat-Stroke

During the summer season sun-stroke or heat-stroke is caused due to exposure in bright sunshine. This produces restlessness, headache and giddiness. The person feels like vomiting and his temperature rises high. His respiration increases and he feels thirst. His face turns red and sometimes he becomes unconscious.

Treatment.

The first treatment of such a person suffering from sun-stroke is to reduce the temperature. His clothes should, therefore, be loosened and he should be kept in a cool place. His head and neck should be washed with cold water and ice be placed over his head and neck. This gives sufficient relief to the victim. The patient should be given cold water to drink. If all this treatment does not reduce his suffering, sandal paste be applied on his body. If even this fails to give relief he should be taken to a physician for proper treatment.

Foreign Matters

Sometimes foreign matters enter into children's ear, nose or throat which, though do not give much trouble at the time, should immediately be taken out. Generally, people try to take them out with the help of crude instruments by their own hands which are not used for doing such delicate jobs. The results sometimes are very serious. This should never be done under any circumstances, instead a physician should be consulted.

Small insects, dust particles or thin blades of grass sometimes fall in the eyes while the child is playing, walking or running. This is very painful. Efforts should immediately be made to remove them.

The victim should repeatedly open and close his eyes in clean water. Washing the eye with water or boric solution is also helpful. Blowing the air from mouth to the eye also proves useful and relieves the pain. If the foreign matter is in the upper lid, the upper eyelid should be stretched over the lower one. This will enable the eyelashes of the lower lid to remove that substance. This process should continue till the matter is removed.

Sometimes flies, small seeds, insects or blades of grass, etc. enter the ear which besides being painful also produces deafness. This causes swelling in the ear. There is always a fear of this swelling reaching the brain as well.

In this condition putting some oil in the ear is very helpful. The matter in the ear leaves its place and floats on the oil thus coming out of the ear. If the oil treatment fails, the child should be taken to an ear specialist.

Sometimes things like beans, peas and grass blades enter the nose of children and create trouble. In such conditions, the child should be made to smell things that produce sneezing. The nostril that is inhaling air should be closed and efforts should be made to sneeze through the blocked nostril. The child at this time should be advised to breathe through mouth. If these methods fail to remove the matter from the nose, a doctor should be approached.

An obstruction created into the throat by foreign matter also creates a troublesome situation. The face turns bluish, throat is choked, eyes appear to be coming out of their sockets and the victim turns senseless. In this condition efforts should be made to remove the obstruction by putting the finger in the throat. This could cause vomiting and the obstructing matter would come out. If this fails, the back in between the shoulders should be patted, forcefully. If even this method fails to produce the desired effect, artificial respiration should be resorted to. A physician should immediately be called and the victim should be made to stand on his head by raising his legs towards the sky. There is a possibility of achieving success by so doing.

Drowning

The man becomes unconscious when he drowns in water, because the water enters the windpipe creating obstruction in his respiration. He feels cold. In this condition efforts should be made to bring him to senses. Immediate help of a doctor should be sought. All the tight-fitting clothes of the drowned man should be loosened carefully. His legs should be raised upwards for taking out the water from his body. Artificial respiration should be continued till he begins to breathe air of his own accord. When the victim regains breathing he should be covered with blanket and hot-water-rubber bottles be placed by his sides. If he is able to drink, hot drinks like tea or coffee should be given to him.

Burns and Scalds

Burns are caused when one's skin comes in contact with fire, electric current, hot metal or acid. When the skin is burnt by a liquid or steam, it is called scalds.

Symptoms.

The skin turns red when it burns or scalds. There is unbearable pain and the clothes stick to the burnt spot. The burning sensation caused by the formation of blisters is extremely painful. Sometimes, besides the skin, the flesh below it, too, is burnt.

Severe burning produces shock as the result of which one may die. His face turns yellow, he feels cold, his respiration and heart-beatings slow down due to shock.

Treatment.

- (1) The clothes from the burnt spot should be removed carefully. The cloth should be cut if it sticks to the wound. Some kind of oil should be applied over the burnt spot.
- (2) A solution containing a spoon of soda bi-carbonate in about a pound of water should be applied on burnt places with the help of cotton or piece of clean cloth.
- (3) The burnt spot should be put in water having body temperature.
- (4) Blisters should not be opened, because by so doing there is a possibility of catching contagion.

- (5) Tannic acid jelly ointment should be applied over the wound. It produces cooling effect and cures the destroyed tissues. Iodex or Repento ointment, too, is useful.
- (6) After applying these ointments, clean cotton should be placed over the wounds and it should be bandaged.
- (7) Efforts should be made to overcome the shock. The patient should be kept warm by covering him with blankets and by keeping hot-water bottle besides him. He should be given hot milk, tea, coffee or half a glass of clean water with a spoon of ammonium carbonate or the solution of vanishing salt.
- (8) Solution of soda bi-carbonate applied over the wounds through a gauze also relieves pain in the case of acid burns.
- (9) Vinegar or lemon juice solution made in water proves beneficial in the case of burns caused by alkalines.
- (10) The person should immediately lie down on the floor when the clothes catch fire and he should continue to roll till the fire is extinguished completely. The fire also extinguishes if the victim is covered by a piece of blanket.

SUMMARY

Fracture are of four categories : (1) Simple fracture, (2) Compound fracture, (3) Complicated fracture and (4) Green-stick fracture. Besides, dislocation of bones and sprains are also related to it.

Bleeding can be divided into three categories : (1) Cutting of limb or any body part, (2) Bruises and (3) Insect sting or bite.

Unconsciousness is caused by the following factors :

(1) Poison, (2) Sun-stroke or heat-stroke, (3) Bleeding from head, (4) Injury or concussion, (5) Shock and (6) Hysteria, epilepsy or unconsciousness from blood.

Care should be taken when foreign matter enters eye, ear, nose, throat or stomach and also during burns or scalds.

EXERCISES

1. What are the different kinds of bone fractures ? What are their symptoms and how should they be treated ?
2. Give a brief account of bleeding.
3. What causes unconsciousness ? How is it removed ?
4. What should be done when foreign matter enters eyes, ears, nose, throat and stomach ?
5. What kind of treatment should be made when a child gets burns and scalds ?

Chapter Nineteen

Physical Exercise, Fatigue And Rest

Physical exercise is as necessary for health as is the nutritive and balanced diet. Physical exercise is related to the actions of muscles and it is necessary for the proper blood circulation so that the muscles should remain reasonably active. Muscles are controlled by the brain but the brain itself cannot remain in good health if the blood circulation is not proper. The muscles, brain and the blood circulation are, therefore, interdependent. Evidently, physical exercise is absolutely necessary for activating the muscles. It helps both the physical and the mental development. Those who are engaged in manual labour need mental exercise. While persons doing mental work need physical exercise. This helps the balanced development of the two fields of activity. In its absence only one-side development will take place. Exercise is, therefore, very necessary for the healthy growth of body and mind.

Benefits from Physical Exercises

Regular exercise not only helps the muscles but all the organs of the body. It accelerates the function of heart as the result of which the heart muscles are put to more work. This makes them strong and these become capable of doing more work in case of emergency.

Physical exercise, besides making the muscles strong, also helps their growth. Consequently, these enlarge in size and come fully under the man's voluntary control. These muscles act according to one's desire and in this way greater co-ordination is established between the brain and muscles.

Exercise helps in overcoming the mental defects, because the brain becomes more powerful. Not only this but the deformities of the body caused by the faulty postures are also cured. The spinal curvature, obliqueness of shoulders, flatness of foot and other body deformities can be got cured through these exercises.

Not only a man is physically benefited by exercise but he also stands to gain educationally. Collective exercises or taking part in sports and games, helps the children to develop the spirit of co-operation, quick decisions, discipline, control, self-support, determination etc.

Rules Relating to Exercises

The following rules should be observed while doing exercises :

(1) The principle of 'proceed from easy to difficult' should be observed. Exercise should be done for a shorter duration in the beginning. Gradually, the duration should be increased. Exercises should be stopped when the man feels tired. Tiredness is the indication of reaching the saturation point. It means no more further exercise at that time, because continuing the exercise ever after that would harm the body.

(2) Exercise should be taken in open place where fresh air is available in abundance. The doors and the windows of the room should be wide opened.

(3) Exercise should be done regularly at a fixed time. Over-exercise for the sake of competition is harmful.

(4) Exercise should be taken according to age. Fifteen to twenty minutes light exercise is sufficient for adolescents. Overexercise is harmful. Young children should be asked to run, jump, glide, dance, sing and take part in sports. This is the best type of exercise for them. The Indian system of 'dand' and 'baithak' will prove harmful during early adolescence. This kind of exercise can adversely affect the heart. It is, therefore, advisable to prescribe exercise after keeping the age in view.

(5) Weak children should not be subjected to hard exercises. Walking in fresh air, body massage and deep breathing exercises are enough for constitutionally weak children. Persons engaged in mental work, should play tennis, football or do horse-riding. This kind of entertaining exercises are beneficial for them.

(6) Exercise should not be taken with an empty stomach or just after taking food. This is very harmful.

(7) Drill produces more fatigue as compared to exercises. Young children should not, therefore, be asked to perform drill. Drill also tires the brain along with the body. Attention should, therefore, be paid more to sports than to drill.

(8) The person taking regular exercise needs nourishing diet. His diet should necessarily include milk, almond, green vegetables and butter. Those who are non-vegetarian should eat meat, fish, egg etc. Ground-nut and germinated grams are also very wholesome.

Fatigue

After continuously doing a work, a stage is reached when a man feels overworked and likes to stop it. This state is called fatigue. Fatigue creates such a mental state that the desire to work disappears. The tired children will have their hands and the whole body inactive. Their shoulders will not be straight and their calves will be bent. Such children yawn and place their hand on forehead frequently. They cannot concentrate on work and they commit many mistakes.

Causes of Fatigue.

Brain, spinal cord, nerves and muscles are responsible for keeping our body active. Brain and spinal cord produce impulses which are carried by nerves to muscles. On receiving these impulses, the muscles expand and contract. In this way, the causes of fatigue can be divided into two parts : (1) physical and (2) mental.

A chemical action takes place in the body when the various organs become active. This action produces lactic acid and carbon di-oxide etc., which are poisonous products. The body becomes inactive when these substances accumulate in larger quantity in it. The muscles and nervous tissues also lose the power to do a work at that time.

The nerves are comparatively less affected by fatigue and, therefore, they easily regain strength and become normal, but the brain and spinal cord tire in a shorter period. Their tiredness affects the muscles which are also tired as a result. Tiring of muscle due to physical exertion or fatigue and of brain due to mental exertion—both are related to nerves.

Some Measures for Removing Fatigue

Proper seating arrangement should be made for the children. Too many children should not sit in a single room. The rooms should be so built that sufficient light and air are available. Schools should be built in places where the atmosphere is peaceful. This will enable the boys to concentrate on their lessons easily. The boys reading in schools built in the heart of markets have to tax their energies more in concentrating over lessons. Consequently, they get tired in a shorter period as compared to those students who study in a peaceful atmosphere.

The teachers should keep in view factors that create due fatigue in children. Efforts should be made so that the children who are afraid of their parents and examinations may gain self-confidence. Only those teachers who enjoy confidence of students can only succeed in this work.

Sound sleep is very necessary for removing fatigue. Children who do not sleep for sufficient time soundly, cannot do mental work efficiently. They appear restless and become short-tempered. Sound sleep is absolutely essential for overcoming mental fatigue. It provides that much needed rest which protects the body from those harmful products that are produced in the body as a result of fatigue. Besides, the children gain in height and weight while asleep.

While resting in day one should lie on the back. It more beneficial because in this manner the muscles get ample opportunity to relax. The heart also gets rest because the beatings decrease.

A bout twelve hours of sleep for children between four and eight years, eleven hours for those between eight and twelve years, ten hours for boys between twelve and fourteen and nine hours sleep for boys between the age group of 14 to 16 years is necessary to ensure proper and healthy development. Provision for sleeping during day should exist in nursery schools. This is very useful. Children below the age of seven years should at least get 40 minutes sleep in the day after meals.

Insomnia, that is, lack of sleep is also a problem. Mothers sometimes give narcotic drugs to children for making them sleep. But this should not be resorted to in any circumstance. These narcotic drugs tell adversely on health and particularly on the brain of children.

For preventing fatigue, one should change over from one work

to another. This is entertaining, and provides rest also. Light and entertaining work like gardening, playing and walking are useful for those who are engaged in mental work. Similarly, those who are engaged in physical labour, work like writing, reading or playing any game proves beneficial.

SUMMARY

Exercise should be taken regularly and the principle of "From Simple to Difficult" should be observed. Exercise should be taken at a fixed time daily in open air.

Lack of interest or disinclination towards work is a sign of fatigue. There are two causes of fatigue : (1) Physical and (2) mental.

Extraordinary fatigue is also felt occasionally due to physical or mental disorder. Overwork also produces excessive fatigue.

Sound sleep gives sufficient rest and removes fatigue.

EXERCISES

1. What do you understand by physical exercise ? Write an essay giving full details.
2. What is fatigue ? What are its categories ? Describe its symptoms and show how can it be overcome.
3. What do you understand by rest ? Write an essay on sound sleep.

Chapter Twenty

School Situation, Building, Furniture And Medical Examination

1. Situation

The place and situation of the school plays an important role on the health of children. Attention should, therefore, be paid to the following factors while establishing and building the school :

- (1) Neighbourhood,
- (2) Water and air,
- (3) Soil and
- (4) Direction and surface.

Neighbourhood

The building of the school should be so situated that as far as possible, the distance is almost equal for all the attending students and they do not experience much fatigue in coming to the school. An ideal school is that which is situated near the locality in an open space. Provision for play-ground should exist so that the students may get open space for games and sports as well as fresh air. A school should not be situated in a sium area, near a railway station or in the centre of a market-place. In such places, the atmosphere is not peaceful and there is always a risk of accidents. Besides dust, smoke and lack of fresh air would prove detrimental to the health of children. Trees, too, near the school building are harmful. These obstruct the flow of fresh air and also stop the light. Dustbins, leather factories and animals should not remain near the school because foul odour coming out of them would affect the health of children.

Water and Air

The school building should be built at a place where sub-soil water level is at a depth of more than ten feet. Clean and good water is found only after the depth of ten feet because all the foul matter is left in the upper layers of earth. This water is filtered through previous earth and becomes clean and harmless.

Similar to the relation of water and earth is the relation between the earth and air. Air exists in pervious earth. The quantity of air in earth depends on the quality of earth. Proportion of air differs in various kinds of earth. Air exists in larger quantity in sand, gravel and chalk soils as compared to clay soil.

There is a difference between sub-soil air and that which exists above the soil. Carbon di-oxide is present in larger quantity in sub-soil air, while the quantity of oxygen is proportionately less. The sub-soil air abounds in impure and harmful gases. The number of germs, too, is larger in it. If this sub-soil air somehow enters the school building it will adversely affect the health of students. They will fall victims to a number of diseases. The position of sub-soil earth depends on sub-soil water. As the sub-soil level of water comes upwards, the air also rises upwards. During rains when the level of sub-soil water rises upwards, the air comes out of the soil and enters the school building, thus polluting the fresh air. It is, therefore, necessary, that the depth of sub-soil water should be examined at the site of proposed school building.

Soil

Ordinarily, the soil can be divided into two parts :

(i) Porous and pervious and (ii) impervious.

The water easily penetrates the porous soil and flows through it. The proportion of air in this kind of soil is greater. Gravel and chalk soils come under this category. Solid and smooth soil absorbs the water and does not allow it to flow out. It is because of this that the soil remains damp and wet for a longer time. Such places are cooler and damper. In these places the transformation of sub-soil water into the steam is a continuous process which is harmful for the inhabitants. In places of damp climate diseases like catarrh, gastric pains, measles, cough, malaria and lung diseases abound. The school building should, therefore, not be constructed in such places. Only dry surface with porous soil is suitable for should

buildings because the rainy water easily flows through it and the soil dries.

It is, therefore, advisable to examine the soil before constructing a school building, because the climate of that place is affected by the soil and sub-soil water.

Direction and Surface

The face of building should be in such a position that sunlight and fresh air may all the time be present throughout the working hours. South is the correct direction and most suitable one. The plinth level of the school building should be high. Low plinth level will allow the rain water to enter the room making it wet and damp. This dampness may produce many diseases.

2 Construction and Design of School Building

The above stated facts should be kept in view before designing and constructing the school building. The foundation should be laid deep with a layer of at least one and half foot of concrete. The walls should then be raised. This will stop dampness and sub-soil air to enter the building.

Walls.

The outer walls should be made of bricks and stones. The walls should be at least of a brick and half thick, that is, about 14 inches. The stone walls should not be less than 20 inches in thickness. The plaster of the walls from ground level upto a reasonable height should be of a material that may check dampness appearing on walls. A mixture of cement, moorang (known as Kalpi sand) and damp-proofing powder plastered to a height of four feet will prevent dampness. If the walls of the school building are made of clay, tar should be painted on them upto four or five feet in height from the floor. This coating of tar prevents dampness and protects the walls from the reactions of alkaline objects.

The inner walls of the school building should be plastered and painted. Dampness appears on the walls, if these are not painted. Lime or ordinary paints alone are not enough for removing this defect. Germicidal products should be mixed while painting the walls.

Floors.

The floor should be strong, smooth and clean. It should neither

be slippery nor rough. It should be so constructed that it may easily be cleaned.

Roofs.

The roofs should be strong and thick enough so that they may neither become so cold in winter that the room may be affected nor in summer should these become hot and affect the temperature in the rooms. Rain-water pipes should be so placed that the rain-water easily flows out without seeping into the walls. It is advisable, therefore, that the rain water pipes should run down leaving a little gap between the walls and pipes. The walls near the places where rain-water falls through pipes should also be plastered so that water may not find its way in the foundation.

Storeys.

The school building, as far as possible, should be single-storied. Although, due to paucity of space in cities, double or treble-storied school buildings are constructed, but these prove unsuitable for school purposes. The children get tired while ascending or descending the stairs and sometimes they fall down from the stairs and receive grave injuries

Doors and Windows.

Sufficient number of doors and windows should exist in the building so that fresh air and light may reach in every corner of the building. The presence of many doors and windows enables the fresh air to rush inside displacing the foul air within a short time of opening of doors. The school building should have at least two main doors.

Stairs.

If due to paucity of space, multi-storied buildings have to be made than careful attention should be given to the design of stairs. There should be a solid wall on both the sides of the staircase and each step should be from four to six feet long, one foot wide and six inches high.

Rooms of the School Building.

The rooms of the building should be spacy and each student should have 225 cubic feet of space. There should exist a space five feet high and three feet wide for each student. The height of the room should be 15 feet. In this way, a class-room meant for 40 students should be 30 feet long, 20 feet wide and 15 feet high. If it

is not possible to construct such big rooms, their area could be reduced but each student should at least get a minimum of 192 cubic feet of space. The rooms of primary schools may be smaller.

Teacher's Room.

In every ideal institution there should be a separate room for teachers, where they can relax during vacant periods. A bath-room should also be attached to it. A separate room should also be provided to the headmaster or the principal as the case may be. Adjoining this room should be the school office.

Doctor's Examination Theatre.

An examination theatre is also necessary for the medical check up of the students. This room should be equipped with instruments for examining ear, nose, throat, eye and other organs. Such an equipped room is an asset for the school. Medical examination does not in any way disturb the working of the institution. Students of different classes can come and get themselves examined in turns.

Lavatory and Urinals.

Lavatories and Urinals are necessary for schools. Separate arrangements should exist for boys and girl-students. These places should be at a reasonable distance from the main building and special attention should be paid towards their cleanliness. The lavatories and urinals should be so designed that sufficient air and light may reach there. The floors should be made of cement so that it can be easily washed with water. Attention should be particularly paid towards the level of the floor so that after washing it no water remains on it and easily dries up. The walls should be made of smooth bricks. Tiles can serve this purpose well. The walls should be plastered. In case it is difficult to make this arrangement, provision may be made of 'earth closet' or automatic earth closet. The urine and excreta of the day should be get removed daily and thrown in an open space far away from the school.

Arrangement of Light and Air.

Existence of a number of windows in the room will ensure a good supply of air. Windows should exist on both sides so that there is a cross ventilation and the air may enter from one side and pass out from the other. Arrangements should be made of ex-

hairs, air circulation of fans during summer and rainy seasons because it is hot in these months and fresh air is needed most

Size of the School Building

For maintaining control and keeping eye over the activities of the students the building should be so designed that the entire things may be visible from one place. With this end in view an ordinary school building is constructed in three ways : (1) building which has a central hall, (2) those which are oval in shape and (3) which have field inside.

Central Hall Plan Schools.

In such schools there is a central hall around which are the class-rooms. Such institutions do not need more space. This design is, therefore, suitable for schools in the cities. Such buildings can be made double-storied and each story can have a central hall.

In this kind of building natural air cannot reach in sufficient quantity. As such, this shortage of air has to be made good through mechanical devices. This needs plenty of money. Even then this arrangement is not very suitable. The number of windows on walls is less because except the corner rooms other rooms do not possess their independent walls. Consequently, there is no arrangement of cross ventilation. The rooms of such buildings get insufficient light because with the hall in centre there is only an inlet for air.

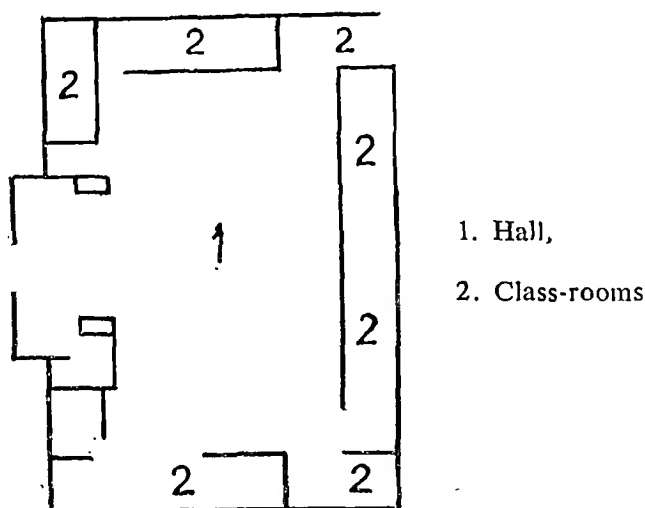


Fig. No. 55 The Central Hall Plan School

During cultural or physical shows in hall, teaching in class-rooms is disturbed because the sound attracts the attention of children sitting in other rooms.

Pavillion or Staffordshire Schools.

This type of building was for the first time built on a plan made by Dr. Reed in which an attempt was made to remove the shortcomings of the Central Hall Plan type buildings. According to this plan, the proposed building is divided into two wings. In one wing are held teaching classes and in the other are situated teachers' rest room, hall and other rooms. The two wings join like straight lines forming an angle. Classes are pavillion like with a verandah in the front. There are windows on both the sides of the rooms

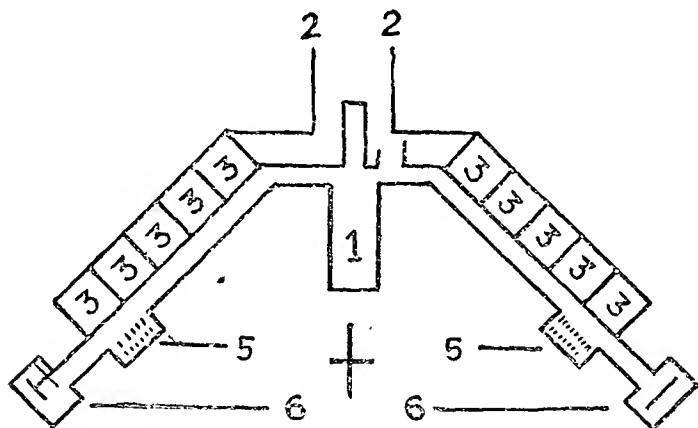


Fig. No. 56 Pavillion School

through whom fresh air and sufficient light enter the room. From the health point of view this type of building is better than the former type, but it is unsatisfactory as far as educational utility is concerned. This type of building may be multi-storied. Generally, this type of building remains single-storied, because ascending or descending the steps creates difficulties.

Courtyard Plan School.

In this kind of school buildings there is a rectangular field in the centre around which rooms are constructed. In this type of building more air and light is available in the rooms as compared to the Central Hall Plan type of building. In the centre field of this

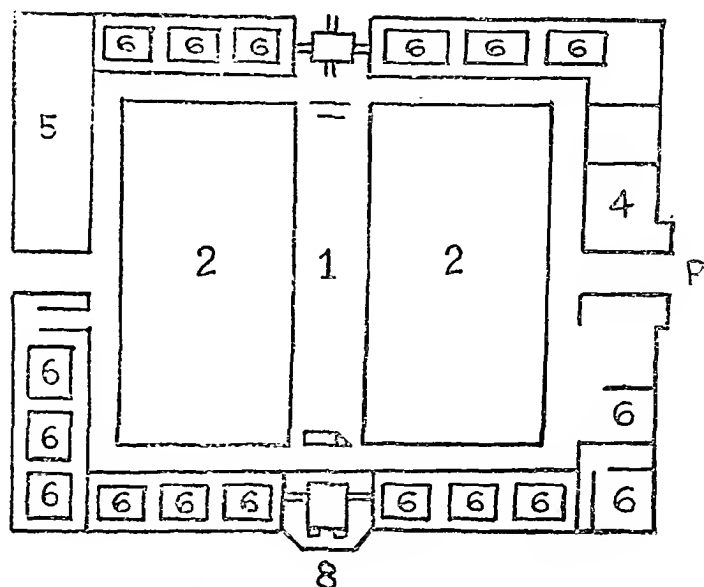


Fig. No. 57 Courtyard Plan School

1. Hall, 2. Playground, 3. Open path, 4. Cloak-room, 5. Laboratory, 6. Teachers' Room, 7. Principal's Room, 8. Entrance, 9. Class-rooms.

building there can be constructed a hall bisecting the main building into two parts.

This type of building is most suitable from control or discipline point of view. Its utility from education point of view is greater. This type of building is superior to those mentioned earlier.

3. School Furniture

The school furniture has an important bearing on the health of students. The size and shape of the desk is particularly important but unfortunately much attention is not paid towards this in our country.

The absence of suitable desks affects the vertebral column. If the desk is high, the student with a short stature will have to bend his backbone on one side and the distance between the book and eyes decreases. Consequently, defects appear in the eyes. The student cannot write smoothly as a result of which his hand-writing becomes ugly and bad. Similarly, unsuitable chairs, too, have a bad affect on the body.

Desks.

The desk should be slopy. It should not have a slope more than 15° . Both the eyes experience equal strain if the book is read at an angle of 45° and in so doing, less body energy is lost.

Ordinarily, desks are of three kinds :

(1) Zero, (2) Plus and (3) Minus.

The front edge of the zero desk is in line with the front edge of the chair. This type of desk is most suitable for writing purposes.

There exists some distance between the plus desk and the chair. This type of desk produces many defects in the body because the student has to bend his body forward.

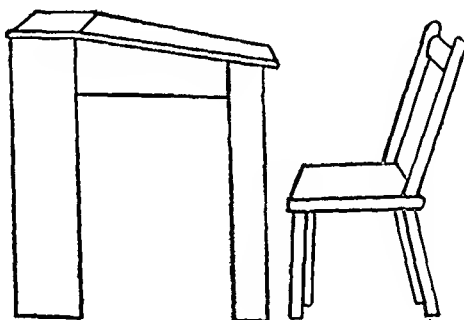


Fig. No. 58 Zero Desk

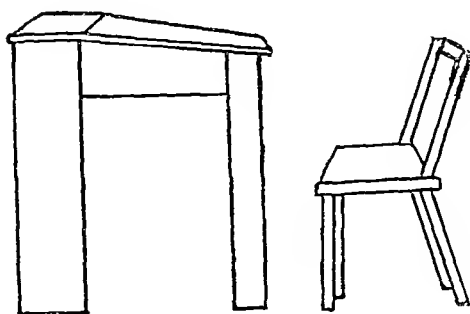


Fig. No. 59 Plus Desk

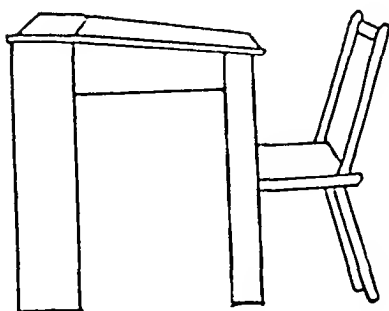


Fig. No. 60 Minus Desk

The front portion of the minus desk facing the child and the front side of the chair cross each other vertically. The chair cuts inside the desk. This type of desk is more useful than the other two mentioned earlier. But this type of desk should also be made according to the height of the students. The upper plank of the desk should be above the stomach of the boy. In the case of minus desk, the children experience difficulty in standing up and they cannot move their body freely.

Faringdon desks are the best amongst the joint type of desks. Chairs are attached to them which can be changed to desired positions according to the needs of the students. These can easily be fixed in zero, plus or minus positions.

Blackboard, Almirah and Stage.

Blackboards made of slate are more suitable as compared to those made of wood. These can be easily cleaned. The colour of the slate should be black. The wooden blackboards should be placed in such a position that they may not dazzle and the students can see without straining their eyes. The blackboard should be at least four feet wide and two to four feet above the floor level. The blackboards made on the walls are more useful.

Besides the blackboard, an almirah, a platform, a table and a chair are also required by the teacher. Almirah should be carged out in the wall. It is used for safely keeping the books, pen, ink-pots, chalk, duster and the students' exercise books. The platform is of great use for short-statured teachers. Many schools have big wooden rectangular desks (chaukis) that serve the purpose of platform but these make the cleaning of room difficult. The brick platform is the most suitable one. The platform should be six to twelve inches

in height. On this platform the table and chair of the teacher should be placed.

4. Provision for Medical Examination

The need of a separate room in the school building for medical examination has been emphasised earlier. Provision of medical check of students is absolutely essential. A number of students in every school suffer from one or the other diseases. Provision of medical facilities in a school considerably helps in the treatment or early diagnosis of diseases.

Every student should be medically examined at least four times during his early education period. First, at the age of five or six when the child is admitted in the school, next when he is ten years of age and completes the primary education. The third time, he should be examined when he leaves the junior high school. He should also be examined for the fourth time when he enters the high school.

The first medical check-up should take place in the presence of parents. Special attention at this time should be paid to the physical deformities and uncleanness. The second medical check-up should be conducted in the presence of the teacher. During this check-up eyes, ears, throat, lungs etc., should specially be checked. The third check-up should concentrate on the physical development of the body and attempts should be made to find out if there are special changes. In the fourth check-up, it should be ascertained whether the school life had any special effect on the physique of the student and whether the student is fit to undertake heavy work.

Generally, during medical examination, the weight of the student is taken. Besides, his height and the girth of the chest are also measured. This gives an idea about his physical development. The clothes of the child and his head, eyes, ears, nose, teeth, nails etc., should particularly be examined. The successful result of the medical check-up depends upon the way in which the guardians, teachers and other persons concerned feel their duty and responsibility towards the child. These persons should ever remain vigilant and perform their duty towards the child with devotion.

The school physician should regularly examine the health of the student. On his advice, special diet should be given to the students and they should be admitted in schools, according to his advice. It is the duty of the school doctor to find out children suffering from infectious diseases and make arrangements for their isolation so that

other students may not catch the infection. He should supervise the work of the school nurse and maintain a record of child's health. He should also inspect the arrangements of light, air, sanitation and physical exercise in the school.

Provision of a nurse is also necessary besides a physician, because with her co-operation, it becomes easier to gain knowledge of children's health. The school nurse should daily keep an eye over the cleanliness of children. She should inform the students of the date and time of medical examination so that they may appear at the appointed hour. It is also her duty to maintain a card recording the facts about the student's health. It is necessary to have the previous history of the student in preparing his card. She should visit every house and acquaint herself with the family and home environment of the student.

The medical examination work in the school will remain incomplete in the absence of teacher's co-operation with the doctor. It is, therefore, necessary that their co-operation is available to the doctor. Besides, the teacher should have a reasonable knowledge of infectious diseases, their diagnosis and treatment.

Proper treatment should be started of the diseases diagnosed during medical examination. If careful and proper treatment is not undertaken, all the labour of the school doctor will be lost. A school dispensary for proper treatment is necessary for treating cases of ear, nose, throat, teeth, eyes, vertebral column diseases. In India, such dispensaries are short in number. There are hardly some school dispensaries in rural areas. Attention should, therefore, be paid to this aspect.

SUMMARY

The neighbourhood, water, air, earth direction and surface should be carefully examined before constructing a school building.

The school building should not be built in thickly populated and dirty localities and slums. It should also not near a railway station, workshop or market-place. The foundation of the school building should be laid deep. Its walls, roofs and floors should be strong. The school building, as far as possible, should be a single-storied one.

The rooms of the school should be spacious and provision of 325 cubic feet space should exist for each student. It is necessary

in height. On this platform the table and chair of the teacher should be placed.

4. Provision for Medical Examination

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The rooms of the school should be spacious and provision of 325 cubic feet space should exist for each student. It is necessary

that a teacher's rest room, medical examination room, lavatory and urinals should be provided in the school building.

The school buildings are made in three ways : (i) Central Hall Plan building, (ii) Pavillion building, (iii) Courtyard Plan building. The third type of school building is the most suitable one.

Amongst the school furniture, desk, chairs, blackboard and almirahs are important. Desks are of four varieties : (i) Zero, (ii) Plus, (iii) Minus and (iv) Faringdon desks. Separate desks are more suitable than the combined ones.

Desks and chairs should be made according to the physical stature of students. The blackboard made in the wall is better than a separate wooden blackboard.

Arrangement for medical check-up of the student should exist in schools.

EXERCISES

1. What factors should be kept in view while constructing a school building ?
2. What are the various types of school buildings ?
3. What kind of furniture should be used in schools ?
4. What do you understand by school medical examination ? Discuss its ideal nature for a school.

Chapter Twentyone

Infectious Diseases

Infectious diseases may be classified into two categories : (1) Simple infectious diseases and (2) Serious infectious diseases. Infectious diseases reach from one person to another in two ways—directly and indirectly.

Causes of Infectious Diseases

Very small germs like a curve snail which can be seen only through a powerful microscope, cause infectious diseases. These germs multiply in number and try to establish themselves in the body as soon as they enter it. There are many mediums through which they travel and enter the body.

(1) Through air.

These germs come out of the body of a patient with the air exhaled through nose or mouth and get mixed in the outside air. They enter the body of a healthy person when he breathes fresh air. That is why such an infection is called droplet infection, because the germs are formed in the droplets or infected sprays from the nose or mouth of the person suffering from the disease. The infectious diseases that spread through air are small pox, measles, cough, influenza tuberculosis etc.

(2) Through Contact.

These germs enter the body of a healthy when he comes in contact with a patient suffering from infectious diseases. Not only his direct contact causes infections but even a healthy person catches in-

fection when he comes in contact with the clothes, books, chairs, tables etc. of the diseased person.

(3) Through Edibles.

The germs also spread through food and water. When a healthy person takes food that had come in contact with a diseased person the germs enter his body and he falls ill. The germs of tuberculosis which are present in milk, cause tuberculosis.

(4) Through Insects.

Insects like mosquitoes, flies, bugs and lice also serve as germ carriers. When these insects suck the blood of a patient, the germs stick to their trunks or stings and when the same insect bites a healthy person the germs are left in his body. Mosquito bites cause the dreaded diseases of malaria. Flies are the repository of diseases. They cause many serious diseases.

(5) Through Skin.

Skin prevents the growth of germs but rubbing of skin causes germs to enter through it. Germs of Tetanus and Anthrax reach the body in this manner.

(6) Through Genital Organs.

Dangerous diseases like syphilis and gonorrhoea reach from one person to another through intercourse when penis contacts vagina.

(7) Through Carrier.

The infection spreads through a certain type of persons who although possess infectious germs in the body, remain healthy. The symptoms of diseases do not appear in such persons but when they come in contact with other persons, they (the other persons) catch infection. Such persons are called disease carriers. Blood dysentery, typhoid, diphtheria etc., are diseases that spread through persons who are disease carriers.

Chief Characteristics

(1) Each infectious disease has a fixed time limit during which the man remains ill.

(2) It spreads from one person to another.

(3) A person suffers only once from one type of infectious disease, because once he is attacked, he becomes immune from it. Influenza and diphtheria are exceptions to this general rule.

(4) Each infectious disease is caused by a different kind of germs. For example, plague is caused by plague bacillus, measles by measles virus and so on. These germs multiply in number as soon as they enter the body and produce poison. The poison produced by one particular type of germ differs from that produced by another.

(5) The first stage of an infectious disease is called incubation period. During this period neither the symptoms appear nor can it be said that a particular person is affected by a particular disease. The ill effect of the disease is not particular disease. The ill effect of the disease is not visible till their number multiplies and they gain in strength. The incubation period of each infectious disease differs, but it is fixed in each case. After the incubation period comes the onset period during which the symptoms of disease appear.

Symptoms of Infectious Diseases

(1) First of all, the man's temperature rises which produces poison in the body. Consequently, the heat producing and heat discharging arrangements in the body become inactive.

(2) The man feels cold even in height temperature and his entire body shivers.

(3) Small red rashes appear over the body which indicate the functional inactivity of the skin.

(4) Indisposition, headache, throat troubles in children are also indications of infectious diseases.

Prevention of Infectious Diseases

(1) For preventing the outbreak of infectious diseases a physician should be informed first of all so that he may make efforts to check the outbreak of the disease.

(2) The victim should be isolated from healthy persons.

(3) As a preventive measure, persons should get themselves inoculated or vaccinated. This can prevent the outbreak of disease.

(4) At the slightest suspicion of catching infection, the man should be isolated during incubation period and symptoms should be carefully observed. During this period either symptoms would appear or the disease would end.

(5) The things used by the patient should be thoroughly disinfected so that the germs may be completely destroyed.

Measles

Measles is a very common infectious disease. Its consequences are grave. Generally, small children fall victims to this disease. If careful and proper treatment is not given, many serious complications arise and sometimes the patient dies. The incubation period in this disease is of a week's duration.

Symptoms.

The patient first of all complains about cold and headache. Then the temperature rises high along with cough and sneezing. Water flows from eyes and nose. The correct diagnosis is possible only when small rashes appear over the body. These coarse blotchy rashes are visible on or after the fourth day. These small rashes are first of all visible on the forehead, temple and behind the ear. In the early stage these rashes are of dusky red colour. These remain prominent for two days and then start drying. The fever, too, shows a downward trend. Within eight or ten days, they dry up completely and the patient recovers.

Treatment.

In the absence of careful treatment, the disease takes a serious turn. The patient should always be saved from catching cold because slightest cold can cause bronchitis and pneumonia.

The incubation period of measles is very dangerous because infection generally spreads during this period. If any symptoms of the disease are observed in a child in the school, he should immediately be sent home. The child who had an attack of measles should not be permitted to attend school for at least three weeks.

Mumps

This disease is not dangerous like measles. The germs in this disease affect the gland below the ear as a result of which it swells. Sometimes, the glands at the angles of the jaws and in front of the ears are also affected. This causes swelling and difficulty arises in taking food.

The incubation period of this disease lasts from two to four weeks. The onset of the disease produces pain at the end of the lower jaw below the ear. Besides, there is stiffness and tenderness at the affected spot. Gradually, it spreads up to the neck which makes it difficult to open the mouth and eat anything. The swelling, pain and stiffness, generally subside in a week or two.

The germs of the disease are found in the sputum, saliva and the air exhaled by the patient. The disease spreads when other persons come near the patient or through sputum. The effect of the disease lasts for four weeks.

The child suffering from this disease should be kept warm in the bed and light food should be given till the swelling completely subsides. He should be isolated so that other persons may not catch infection.

Whooping Cough

This disease spreads from one person to another through a special type of germ that travels in air. This infectious disease of the child is the most harmful one. Its incubation period lasts for 18 days.

In the beginning, the child is attacked with cold. Secretion comes out of his nose. He sneezes and water flows from his eyes. Besides, coughing starts at short intervals. Every attack of coughing lasts for many minutes and the face turns red during coughing. Vomiting generally follows every attack of cough. Whooping cough affects the lungs and there is always a possibility of defects arising in the lungs. This disease reduces the resisting power of lung's tissues. Consequently, there is always a danger of the child falling victim to dreaded diseases like pneumonia, tuberculosis etc.

The children suffering from this disease should be kept in a warm place. He should be saved from dampness and humid atmosphere. Sufficient fresh air should be available to him. The food should be light and easily digestible.

Such children should be granted leave of absence from the school till they are completely free from the disease. Other children should not be allowed to come in their contact for at least six weeks.

Scarlet Fever

This disease is caused by a germ named *streptococcus scarlatinae* which enters the body through tonsils. Generally, this disease attacks children in the age group of five to ten years. The incubation period in this disease lasts from two to eight days.

The patient feels shivering at the start of disease. He vomits and feels pain in the throat. The face turns red and he feels heat and roughness in the skin. Small rashes appear over the neck and

chest. Later on, these small rashes appear on legs and stomach. These rashes appear like deep-red dots over a red skin. They disappear on the seventh day. The dry scabs start leaving the body on the sixth day and within two days the dry covers are completely removed.

The infection in such cases reaches from one person to another through the patient's sputum and ear and nose discharge. It also spreads through the utensils, clothes and books used by the patient.

The children who had an attack of the disease, should not be permitted to go to school till their skin becomes free of the traces of rashes.

German Measles

The symptoms of this disease are very much similar to measles and scarlet fever, but it is not dangerous like any of them. Its incubation period is of about 19 days' duration. Small rashes appear in this disease as in scarlet fever. But these begin to dry on the third day. The symptoms of cold and cough are not present. The lymphatic gland of the thigh generally becomes large and stiff. This is the difference between measles and scarlet fever on one hand, and German measles on the other. It is ascertained by this difference. There is a possibility of the glands being affected by tuberculosis due to this disease. The effect of German measles stays for seven days. The patient should be isolated from healthy persons even after a week of his being cured. The infection in this case spreads through germs in the sputum.

Diphtheria

Children in the age group of two to five years generally suffer from this disease. It is a dangerous, fatal and highly infectious disease. Its incubation period lasts for three days.

Swelling in the throat, formation of a brownish-white membranes over the tonsils and throat tissues and the enlargement of neck glands are some of the main symptoms of this disease. Larynx is also affected and the membranes creates obstruction in respiration. Many parts of the body are paralysed. The heart muscles lose their power of functioning which may cause death.

The germs of diphtheria spread in air when the patient, speaks, coughs or sneezes. Eating in the same utensils used by the patient or coming in contact with the patient affects other healthy children.

The germs also enter the body through milk. These germs affect the throat, larynx, windpipe and the nostrils.

For curing the disease, it is necessary to take the injection particularly prepared for it. It does not allow the disease to take a serious turn and the heat's muscles are saved from being paralysed.

As a safeguard against the disease, children should be examined on the basis of Shick test and resistance power against this disease should be developed in them.

Chicken Pox

Chicken Pox is a disease that generally attacks a large number of children. It is not very serious. Like small pox rashes also appear on the body in this disease. The incubation period lasts from 12 to 19 days while onset period is 21 days' duration.

First of all, rashes appear on the trunk and there is a light fever. In two days these appear all over the body. These begin to dry after three or four days and scabs are formed over them. In few days, the scabs dry and start falling. The germs of this disease spread through the sputum or by contact with the patient. The germs are also found in the scabs. The possibility of infection remains till the scabs dry and fall from the body.

As a precaution, the patient should be got examined through a physician so that the identity of the disease is established. There is always a chance of error in diagnosis by a layman as chicken pox and small pox differ little and misunderstanding can create a bad situation. The patient should be isolated for 21 days.

Small Pox

This is very dangerous and highly infectious disease. The incubation period in this case lasts for 14 days.

At the outset of the disease body shivers, vomiting starts, temperature rises high, face turns red and the patient feels pain in head and back. On the third day, red rashes appear over the forehead and wrists. Gradually, they appear over the entire body. The rashes are blister-like and are full of liquid.

The small pox germs spread through the exhaled air and the secretion from nose and mouth of the patient. The scabs from the skin and patient's contact with others also contribute to the spread of the disease. The possibility of infection remains for a month and a half.

As a safeguard against this disease, small pox vaccination should always be taken. If small pox appears even after the person has been vaccinated, the disease would not be so serious. At the slightest suspicion of the disease, the child should immediately be isolated. Other children of the family, besides the patient, should also not be allowed to go to school.

Influenza

Definite causes responsible for the outbreak of influenza have not yet been established. Many germs cause this disease. The incubation period of this disease is of some hours' duration. Sometimes, the incubation period lasts for some days as well.

The symptoms of the disease are rise in temperature, headache, pain in limbs, shivering due to cold, watery discharge from eyes and nose and sneezing. The attack is sudden and the symptoms immediately appear.

This infectious disease spreads through the patient's exhaled air, cough, mouth and nose discharge. The germs enter the body of a healthy person through his eyes, nose and mouth.

As a precautionary measure, children suffering from cold should be given leave from the school and the school, too, should be closed for some days so that the outbreak may not take the form of an epidemic. In ordinary cases, children having an attack of influenza should not be allowed to go to school for a period of ten days. In extraordinary cases, they should be given 21 days' leave from the school.

Cleaning the nose and throat with common salt solution is helpful. The patient should be given complete rest after the temperature comes to normal. He should also be saved from cold, otherwise he is likely to catch bronchitis and pneumonia.

Encephalitis Lethargica

The nervous system is particularly affected by this disease. This infection spreads through a poisonous germ. Its incubation period lasts from 2 days to 14 days.

The child suffering from this disease remains lethargic and gradually this lethargy turns into unconsciousness. At the onset of the diseases, inflammation is caused in the throat, eyes feel a burning sensation and the eyesight is affected. Difficulty is experienced in speaking. There is headache and sometimes there is an

attack of paralysis on the tongue which may become very serious. The brain is deranged and the nature of the person is affected. He changes all of a sudden.

Contact with the patient or the germ carrier causes the germs to enter the body of a healthy person through eyes, ear, nose or throat and so he falls ill.

As a safeguard against the spreading of diseases, the patient should be isolated. These children who had come in contact with the patient, should not be allowed to go to school for a period of at least 21 days.

Infantile Paralysis

Children between one and five years of age fall prey to this disease. In this disease a particular type of germ affects the grey matter of the chest and waist region as a result of which some of the nerve centres are destroyed, and the connected muscles are paralysed. The incubation period of this disease lasts for ten days.

The patient suffers from cold at the onset of the disease. Inflammation is caused in the throat, temperature rises and the patient experiences a peculiar type of restlessness. The muscles become inactive and this stage remains for some time, but if the effect of disease becomes permanent, the patient's limbs become deformed for the rest of the life.

The infection spreads through the urine, stool, throat and nose secretion and the sputum of the patient. The precaution to be taken for checking the infection of *concephalitis lethargica* should also be taken in this disease.

Cerebro-Spinal Fever or Meningitis

The brain and the spinal membranes of the children suffering from this disease become affected. Generally, children below five years of age fall victims to this disease. There is headache and high fever at the onset of the disease. The entire body feels stiffness. The brain also becomes senseless as the result of which there is a possibility of delirium. Rashes appear over the body. Therefore, it is also called spotted fever. Many physical deformities are left behind when the disease subsides. There is a possibility of the mind being affected as a result of these deformities. It takes at least two weeks' time for the patient to recover completely.

The infection spreads when the patient speaks, exhales air or blows his nose. The germs of this disease remain present in the

sputum and in the nasal discharge of the patient. It also spreads through carriers.

The patient in the disease should be isolated. Fresh air and sufficient rest are required for the recovery of the patient.

SUMMARY

Infectious diseases are of two categories :

(1) Simple infectious diseases and (2) Serious infectious disease. These spread through contact, air, edibles, germs, skin and genital organs. These disease have a fixed duration and are caused by different germs. The incubation period differs in each disease.

At the onset of the disease, temperature rises, red rashes appear over the skin and headache is felt by the patient. The germs should be completely destroyed as a measure of safeguard against them.

Amongst the infectious diseases measles, mumps, whooping cough, scarlet fever, German measles, diptheria, chicken pox, small pox, influenza, tuberculosis, Infantile paralysis and meningitis are worth-mentioning.

EXERCISES

1. How do the infectious diseases spread ? What precautions should be taken as a safeguard against them ?
2. Give a detailed account of the symptoms of infectious diseases.
3. Write brief notes about the following diseases :
Measles, small pox, whooping cough, diptheria.
4. How does influenza spread ? What are its symptoms ?
What precautionary measures should be taken as a safeguard against the disease ?

Chapter Twentytwo

Health Education Programme In A School

Importance

The school is responsible in many ways for the mental physical, moral and spiritual development of future citizens of the State, although the responsibility of the family, State and other concerned persons in this regard can in no way be ignored. Therefore, it is a sacred duty of a school to give a prominent place to health education in its several schemes directed in the interest of the growth of children. So far our schools have miserably failed in this respect, and the educational authorities as well are no better in this matter. The sooner this state of affairs ends the better.

It is true that our country is so poor that most of our children do not get balanced and nutritive diet. Therefore, some people remark that it is a farce to talk of health education of children, if they do not get nutritive diet. Some grain of truth cannot be denied in this remark, but it is also true that we are deprived of the maximum advantages of our even poor resources due to our ignorance of the basic knowledge of health rules. Therefore, it is necessary to remove this ignorance of ours. The State, school, family and others should extend due co-operation in planning an active health education programme for children. Only then we can contribute our mite to the building of a bright future for our children.

The Aims of School Health Education Programme

The main aim of school health education programme is to

acquaint the teachers and students with health rules so that they may be healthy and inspire others to be so.

By a health education programme, we want to bring to the notice of the students the evil consequences of various intoxicants and other bad habits so that a healthy environment may be built up within and outside the school.

In the health education programme we want to pay due attention to the rules of mental health as well. At the same time, we also want to endeavour to inculcate various social virtues in children. For this we shall include various types of plays, games and sports in the health education programme.

The Programme of Health Education

1. Cleanliness.

The cleanliness of the school environment is the first thing to be attended to. The rooms, play-ground, lavatory, urinals and other places should be kept entirely clean. It should not be difficult for any school to attend to these basic things, howsoever, poor it might be financially. But many schools ignore this vital necessity and their rooms and the total environments are full of all kinds of unhygienic conditions. It hardly needs mention that this situation adversely affects the health of children.

2. Arrangement for Adequate Light and Fresh Air.

In the foregoing pages we have emphasised at several places the importance of sufficient light and fresh air in the school. This should be considered as one of the most important constituents of health education programme.

3. Health Examination.

Every student in the school should be medically examined at least thrice a year according to a pre-fixed programme. The result of this examination should be communicated to the concerned teachers and guardians so that the necessary may be done for the child. The progress of health of each student should be carefully watched on the basis of the medical examination result. For this, each teacher should be required to perform his share of the responsibility, and due allowance should be given for this in assigning teaching load to him so that he may not feel over worked.

4. Education in Physiology and Hygiene.

Every student should be made conversant with the basic elements of physiology and hygiene. For, this, at least one period a

week should be devoted. Some suitable lecture by some physician or specialist at least once a month should also be arranged.

5. Good Refreshment and Pure Water.

Pure water must be available in the school. If there are wells, they must be kept in perfect hygienic conditions. Sellers of fruits and other edibles should be carefully inspected and they must not be allowed to play with the health of students by selling rotten and stale things. The school should also arrange for some refreshment in the mid-day. This refreshment should consist of nutritive elements.

6. Physical Exercise.

The students get mental exercise in learning the various subjects, but most of them do not get the necessary physical exercise. For this, facilities of various types of games, sports and plays should exist in the school in order to cater to students with various abilities, inclinations and aptitudes. All the students should be encouraged to participate in these according to their individual interest. Both the Indian and Western styles of games, sports and plays should be organised.

Basic Elements of Health Education

The students should be told in detail about the health rules that they must observe. Their attention should be specially drawn to the following basic elements :

1. The benefits of early to bed and early to rise. The ratio to be observed between the time to be given to study, play and rest.
2. The basic elements of balanced diet, how the diet may be made adequately nutritive.
3. How to save one from infectious diseases.
4. What to do for the health of teeth, eyes and other organs of the body.
5. The structure of the various organs of the body.
6. Importance of health in life.
7. The meaning of purity of water, air and food.

The Methods of Health Education

We are mentioning below some of the most important methods of health education which a school should adopt :

1. The teacher should observe all the health rules. He should not present any bad example before the students.

2. The students should be given to read books and magazines dealing with health rules and principles.
3. The cleanliness of the student should be examined every day with great sympathy.
4. The entire environment of the school should be kept healthy. The room, play-ground, urinals etc., should not be dirty.
5. The specialists should be invited to deliver lectures on health rules from time to time.

Mental Health

We have dealt above with physical health of students. But physical health cannot be separated from mental health, as the mind and body are interdependent. Therefore, it is in the interest of physical health itself that due care is taken of the mental health of the students. In fact, both the physical and mental aspects are necessarily included in the term health. The teachers should keep in mind the following for promoting mental health of students :

1. The teacher should be impartial in his behaviour. He should give due affection and care to all the students. No student should feel ignored.
2. The mental development of the student should be studied from a psychological point of view.
3. The students should be given free environment for the development of various personality traits. They should have opportunity for cultivating various social virtues.
4. Parental co-operation should be sought in removing the bad habits found in students. Under no circumstances the student should suffer from any inferiority complex.
5. Great ideals should be presented before the students from the lives of great personalities of the world.

SUMMARY

Importance

In any scheme of education due place should be given to health education, otherwise all the efforts will be futile.

Aims of Health Education Programme

1. To acquaint every student with health rules.
2. To keep students away from evil habits.
3. To attend to both physical and mental health.

The Programme of Health Education

1. Cleanliness, 2. Arrangement of adequate light and fresh air, 3. Health examination, 4. Education in physiology and hygiene, 5. Pure water and refreshment and 6. Physical exercise.

Basic Elements of Health Education

To draw the attention of the students to the basic health rules.

The Methods of Health Education

1. The teacher not to present any bad example.
2. To encourage the students to read books and magazines dealing with health principles.
3. To examine the cleanliness of students.
4. To keep the environment of the school clean and healthy.
5. To arrange lectures on subjects pertaining to health.

Mental Health

Mind and body dependent upon each other.

The teacher should behave impartially.

Not to ignore any student.

To study the mental development of students.

To enlist parental co-operation.

To present ideals from the lives of great men.

EXERCISES

1. Describe the factors to be kept in view in organising a health education programme in a school.

2. Draw an outline of an ideal health education programme for your school.

PART II

PUBLIC HEALTH

- **Rural Sanitation.**
- **Problem of Population and Family Planning.**
- **Population Education.**
- **Health Problems of India.**
- **Health Services in India To-day.**

Chapter Twentythree

Rural Sanitation

India is a land of villages. About 80 per cent of its population, *i.e.*, about 60 crores of its people live in villages. In a way, our villages have always been away from the main currents of the upheavals of our land, although they have always remained the backbone of the nation. That is why, Gandhiji—the Father of the Nation, used to say that the soul of India resides in villages and unless their condition is improved, the country cannot prosper. Therefore, it was in fitness of thing that in 1947 after achievement of Independence, our government diverted its attention to the upliftment and regeneration of the village people. Towards this end, a number of programmes in the areas of agriculture, health, sanitation, education and building of houses have been started in rural areas through out the whole country. The starting of the Panchayat system infused a new life in the village people and they began to think that they had a say in making their own destiny. Because of the efforts so far made, now there are found schools, health centres, wells for drinking water, family planning centres within the easy reach of most of the villages.

Below we shall understand the items that may be included with in the village sanitation programme.

1. Mass Education.

Most of the villagers are illiterate. They are almost ignorant of health laws and principles. They are badly in need of the requisite knowledge about the same. They must be told about dirty habit pertaining to food, clothing, bath, use of dirty and good water, unhealthy surroundings, dense localities and dirty lanes and unhealthy effects of ponds and tanks full of dirty water. Hence the villages

are in great need of education regarding these things. Slides, lectures, posters and films etc. may be profitably used for their education. With the help of these things they will begin to understand the importance healthy living and will save themselves from many diseases they often fall victims to.

2. Food Sanitation.

One falls ill if he consumes dirty and unhealthy articles. Many of our villagers do not understand how to maintain sanitation of food materials. They should be told about the role that flies and dirt play in spreading many diseases. They should also be told as to how to protect food articles from flies and dirt. They should be educated as to what measures should be adopted for protecting oneself from epidemics and other diseases. They should also be informed as to how to purify the unhealthy water of wells, ponds and tanks. In certain ponds washermen should be restrained from washing clothes. They must also know how to protect food materials and water from cats, dogs, flies and other insects.

3. Water Supply.

The importance of suitable water for human consumption cannot be over-emphasised. People in the villages must know how to obtain healthy water for drinking and for preparing food. Generally, it is seen that in most of the villages wells and tanks are not very deep. Hence their water easily becomes contaminated and spreads diseases very easily. The drainage system in villages should be improved. There are many villages which are either surrounded by unhealthy water or have dirty-inside drainages. Health of our villagers will always be in danger as long as this situation exists. As far as possible a few tube wells may be constructed for providing healthy water to villagers and at some places good wells and tanks should be dug with adequate enclosures with a view to protect them from flies, insects and domestic and other animals. Some adequate arrangements should be made for pumping out dirty water of wells and tanks periodically. Disinfectants should also be used for purifying water from time to time.

4. Disposal of Dead Bodies.

It is generally seen that there is no arrangement, good or bad, for the disposal of dead bodies in villages. Dead bodies of dogs, cats and other animals are generally thrown out in the near vicinity. Consequently, the whole atmosphere becomes dirty and unhealthy. For

sanitation of villages suitable arrangement should be made for disposal of dead bodies of animals.

5. Disposal of Exeretes and House Refuse.

There are no private lavatories in villages. So the villagers use banks of ponds and rivers, open fields, cannals, standing cropfields and other open places for excretions. This feature makes the vicinity of a village very foul. Sewer system is not possible in villages. So trench lavatories and septic tanks may be more economical for villages. Through mass education the villagers must be told that the open air latrine system is very unhealthy as it may spread many diseases of intestines.

The house refuse and the cow and buffalo-dung etc. are generally thrown at the skirts of the village or near some houses. This situation makes the whole atmosphere very dirty. Here various type of flies and insects breed. They make the whole vicinity unhealthy. Consequently, water and food materials are also affected and they become prone to spread various types of diseases. Our villagers must be saved from this unhealthy atmosphere. They should be advised to dig pits for house refuse and these pits should be covered with earth when--ever some refuse is thrown into them.

6. Rural Town Planning.

The above account indicates that our villages are situated in a very unsystematic manner. There is no arrangement worth the name for water supply, light and fresh air there. Consequently, our villagers live in unhealthy surrounding. So there is a need of rural town planning with all the facilities of a healthy living.

7. Primary Health Centres and Dispensaries.

A number of health centres and dispensaries should be established in villages for rendering services in case of simple and seasonal diseases, if not for chronic and serious ones.

Precautions.

For rural sanitation the following points must be taken into consideration, otherwise any programme for the same may not yield the desired results :

1. Generally it is extremely difficult to execute any programme for the welfare of villages because of their peculiar situation, such as lack of suitable means of communications, minimum amenities of life and lack of co-operation from the villagers themselves due to

party politics and rivalries. Hence competent persons with missionary zeal should be selected for executing any programme for villages. Moreover, they must be given the minimum possible amenities of life for working in unfavourably situated villages.

2. For the success of any programme, it is necessary that a programme should be very humble and simple in the beginning and should be framed after the necessary survey.

3. In making a programme, other suitable persons of some relevant department or area should also be consulted for avoiding any mistake.

4. It is better if a number of allied departments co-operate in making and executing and plan for villages.

5. The village people should be continually and consistently educated about health laws and principles, *i.e.*, their health education must never be neglected.

6. It must always be kept in mind that our main purpose is to guide the villagers and to seek their willing co-operation for their own welfare. In other words, we must let them understand that they should be able to help themselves.

SUMMARY

India is a land of villages. About 80 per cent of the people live in villages. Villagers ignorant about health laws and principles.

1. Mass Education.

Slides, films, lectures, and postures etc. should be used for educating villagers about healthy living.

2. Food Sanitation.

Villagers must be told about the nature of unhealthy food materials and the role that flies and insects play in spreading diseases. They should be educated about the methods of protecting food materials and water from unhealthy influences.

3. Water Supply.

Wells and tanks should be sufficiently deep and they should have enclosures for warding off insects, flies and animals. Disinfectants should be used.

4. Disposal of Dead Bodies.

Dead bodies of animals must not be thrown in the adjoining surroundings.

5. Disposal of Excretes and House Refuse.

Banks of rivers, cannals, etc. generally used for excretion. This is bad. Septic tanks and trench lavatories should be prepared. House refuse should be covered by earth every day.

6. Rural Town Planning.

It is necessary for healthy living.

7. Primary Health Centres and Dispensaries.**Precautions.**

Competent people and persons with missionary zeal should be selected for executing any programme for villages. A survey necessary. A humble and simple beginning necessary. Co-operation of other allied departments and of villagers necessary. Our purpose is to guide the villagers.

EXERCISES

1. What are the factors that we should attend to and how in rural sanitation ?

2. What are the precautions that we should observe in rural town planning and why ?

Chapter Twetnyfour

Problem of Population And Family planning

Population Explosion

According to the theory of demographic transition there are the following three stages of pupulation :

1. High Birth and Death Rates.

Population in India is ever on increase. So far its growth has not yet been arrested. The problem of uncmployment and food are closely associated with the population rise which has led our country into object poverty. Ignorance, religious beliefs, superstitions and old traditions have been responsible for high birth rate and lack of medical facilities and food has resulted into high death rate. This situation persisted till 1930.

2. High Birth Rate but Lower Death Rate.

After achievement of independence in 1947, our standard of living has improved. Now we eat and dress in better ways than what we used to do about 35 years ago. We have now better medical facilities. So death rate has been reduced. But to our great dismay, the birth rate has continued its rise and now it has assumed an cnormous size. This situation is very dreadful and it is a great threat to our security, happiness and prosperity.

3. Low Birth and Death Rates.

When the standard of living improves, it results into a wide spread of education. Consequently, people become more conscious about their comforts and they become averse to raising a big family,

because a big family consisting of a large number of children will mean less privileges and comforts to them. That is why it is generally seen that it is the poor man who breeds more children and the rich one does not. No doubt, exceptions are there. So in an affluent society, the birth rate generally decreases and the availability of adequate medical facilities and better nutrition decreases the death rate also. Under this situation the great rise of population is controlled.

State of Population Explosion.

India is undergoing the aforesaid second stage of demographic transition, *i.e.*, we are having high birth rate and lower death rate. This situation is known as the stage of population explosion. We are facing this situation particularly since 1951 and this phenomenon is continuing even to-day to such an extent that we have now a population over 70 crores, whereas the undivided India of early thirties had only about 32 crore people. It is estimated that by the end of the current century our population will cross 100 crore, because it has been observed that 22 crore children are born every year in India and out of this member 14 crore remain living. Our population is increasing at the rate of 1 crore and 50 lakh every year. We possess only 2.4% of the land of the earth and this land is inhabited by 14% of the world population. This alarming condition has struck a death knell to our happiness and prosperity. Hence our Central Government has decided to take certain positive steps to meet this situation. These steps consist of the following measures :

1. To educate women by formal and informal means about family planning.
2. To provide free medical aid under the family welfare programmes.
3. To give more attention to population education.
4. To utilize very widely the state and the Central government services pertaining to family welfare programmes.
5. 21 and 18 years of age have been fixed as the minimum marriage age for boys and girls respectively.

The above measures have been thought of and executed for successfully meeting the problems arising out of population explosion. Needless to mention that this explosion has led to lowering of living standard and aggravating of unemployment problem.

Family Planning

Necessity has led our Central Government to start a very wide official family planning programme. Perhaps, India is the first country in the world which has started a national programme in this area. Since 1952 the Government of India has taken the Family Planning Programme under its direct control. At the time of finalising the First Five Year Plan it was decided to reduce the birth rate to such an extent that it was suitable for the national economic system. During the Second Five Year Plan it was concluded that the rise in birth rate would adversely influence the living standard. Hence the Family Planning programme was greatly emphasized. At the time of the finalisation of the Third Five Year Plan it was found that the birth rate was much higher than what it was estimated to be at the time of Second Five Year Plan. Hence Family Planning services were greatly advertised and the measures for the same were made available free to all poor or rich. This programme was further encouraged during the Fourth, Fifth and Sixth plan periods. The amounts (India Reference Annual 1980-p. 147 (Hindi Edition)) as mentioned below for the various plan periods bear testimony to the Government's ever increasing consciousness of the necessity of family planning programme :

1. First Five Year Plan	About 14.50 lakh Rs.
2. Second Five Year Plan	About 2.16 crore Rs.
3. Third Five Year Plan	About 24.86 crore Rs.
4. Fourth Five Year Plan	About 70.46 crore Rs.
5. Fifth Five Year Plan	About 497.36 crore Rs.
6. Sixth Five Year Plan	About 900 crore Rs.

The Purpose of Family Planning

People have misconceived that the purpose of family planning is mainly to reduce the birth of children. In fact, the reduce the birth rate is only a process helpful in achieving the purpose. The purpose of family planning is also to make the parents conscious about their great responsibility towards the bringing up of their young ones in future. This planning further provides the necessary information about married life, care of the expectant and nursing mothers and sex education. Thus through family planning we want to make each family a happy unit of the society from the economic, social and cultural view points. Evidently, through family planning we do not mean

only to have a control over human life, but we want prosperity of the same. So the family planning programme may be useful from the individual, (India Reference Annual 1980, p. 147 (Hindi Edition) and national view point.

The Individual Point of View.

Too many conceptions adversely affect the health of a married couple. It is difficult to manage a large family consisting of many children. Too many children become a load to parents instead of becoming a source of happiness. This attitude on the part of parents may directly affect the growth of children and many of them become a load on society as well in the form of inadequately developed personalities.

Family Point of View.

If the family is big, the children are sure to be neglected. They will have poor health and inadequate education. Economic difficulties created by a big family will adversely affect the growth of each one in the family.

National Point of View.

Family is a unit of the nation. If families of a nation are not happy, the nation, too, will not be prosperous. That is why poor and unhappy families in our country have made our nation poor and weak in many respects.

Advantages of Family Planning

On the basis of the above discussion we may now summarise the advantages of family planning in the following manner :

1. It is helpful for ensuring the happiness and prosperity of the family.
2. It provides security to ill women and protects their health.
3. It gives an opportunity to the married couple to plan birth of their would be children in terms of their economic position and other relevant aspects.
4. It ensures security to those married couples who due to some inherited diseases do not want to produce children.
5. It is helpful in making children happy and ensuring their good future.
6. It lays down the foundation of a happy family life.

7. Through good and healthy advice it may help childless ladies to produce babies.

8. It provides useful informations to the expectant and nursing mothers.

The Programme of Family Planning

Co-operation of the People.

It should be particularly noted that no family planning programme may succeed in the absence of people's willing co-operation. Government organisations will be able to do very little, if people are not willing on their own initiative. The success of this programme depends upon people's habits, behaviour and prevailing notions. Hence efforts have to be made to make the attitude of the people favourable to this programme. Towards the achievement of this goal the co-operation of popular leaders, social workers and volunteers are necessary.

Devices of Family Planning.

There are many devices of family planning. One should be able to choose the suitable one according to his particular physical and mental disposition. Only one device cannot be recommended for all. Only that device should be considered as suitable which does not mar the happiness of the married life. Below we are hinting at some of the methods of family planning :

1. Perfect Control. This method is excellent if the couple are able to exercise the necessary control over themselves. But this is not very practicable. Hence it cannot be easily recommended.

2. Withdrawal Method. This implies that the semen is made to fall outside the female passage. This is risky and seldom sure, as even a single drop, if flown out inside, is sufficient for conception.

3. Safe Cycle Period. This period is a about seven days before the commencement of the monthly course. It is believed that during this period, conception does not take place at the time of intercourse. This method is not reliable because of the unreliability of the physiological phenomenon and possible lack of control on the part of the couple.

4. Chemical Methods. Certain tablets and Jelly are used for preventing conception. This method should be used under medical advice.

5. **Mechanical Methods.** Condom is a very popular device under this. The Government of India is selling crores of condom every year on nominal prices. They are available even at general stores and grocery shops. This is very easy to use and very reliable also.

6. **Surgical Method—Sterilization.** Vasectomy tubectomy and loop are the devices under this group. In vasectomy, some concerned nerve of the man is tied. This prevents conception. Under tubectomy the fallopian tube of the woman is tied in such a manner that conception is prevented. Loop is for women. This is tied by some trained doctor.

Of all the above methods vasectomy is regarded as the best method for the purpose.

Motivation and Education

The Government of India has made a systematic plan to approach about ten crore illiterate and literate couples for giving the necessary information and services regarding family planning. Besides newspapers, magazines, radio, television, films and dramas are some other devices to educate the public about the importance and advantages of family planning. Population education is being added to the courses in schools and colleges. In the adult education programme also the family planning devices are explained. Labour Unions, Panchayats, Co-operative societies and other local organisations are being mobilized for explaining to the people the advantages of family planning.

The Government of India has also established certain centres of research and evaluation in this field.

It may be noted that even after vasectomy, tubectomy and loop, if some couple want babies due to certain valid reasons, the applied device may be cut out or melted away and the couple may have their normal reproduction cycle into operation.

SUMMARY

Population Explosion

High Birth and Death Rates.

Population in India is ever on increase.

High Birth Rate but Lower Death Rate.

When standard of living is improved, the death rate is lowered.

Low Birth and Death Rates.

With wide spread of education the standard of living is improved. In an affluent society birth rate decreases.

Stage of Population Explosion.

In India, high birth rate and lower death rate. Population explosion in our country since 1951. Our Government has well-thought out plan for meeting the problems arising out of population explosion.

Family Planning

India is the first country in the world for starting a national programme of family planning.

The Purpose.

It is to make a family happy and prosperous. Family planning is only a process towards this end. Economic, social and cultural status is to be raised through this programme.

Useful from the individual, family and national point of view.

Advantages of Family Planning.

1. Helpful in ensuring happiness and prosperity of the family.
2. Provides security to ill women.
3. Sterilization of diseased couples possible.
4. Good future of children is ensured.
5. Provides useful informations to expectant and nursing mothers.

The Programme of Family Planning

Co-operation of the People. This is vital to the whole programme.

Devices of Family Planning.

1. Perfect Control,
2. Withdrawal Method,
3. Safe Cycle Period,
4. Chemical Method,
5. Mechanical Methods—Condom.
6. Surgical Methods—Sterilization-Vasectomy, tubectomy and loop.

Motivation and Education.

Government of India is very active towards this.

EXERCISES

1. What is population explosion ? Explain its underlying causes and the impact on individual, family, society and the nation.
2. Explain the measures that should be adopted for meeting the problems arising out of population explosion in our country.
3. What is family planning ? Explain its purposes and advantages.
4. Explain the various aspects of the family planning programme in our country. What should be done for making this programme a success ? Suggest some concrete measures for the same.

Chapter Twentyfive

Population Education

To-day the population of India is over 70 crore. In fact, our population is increasing every year. Developing population is a world problem.

Population Explosion in India

Due to illiteracy, ignorance, superstitions and old traditions the birth rate in our country has been generally very high. Similarly, because of in-adequate medical facilities and ignorance, the death rate, too, has been quite high. The standard of living has improved a little due to some economic development and medical facilities have also been extended to many parts of the country. This feature has resulted into the reduction of death rate, but the birth rate remains as high as ever. Consequently, the population in the country has been continuously rising. This is an alarming situation for our country and our Central and State governments feel rightly agitated to do something positive for controlling the rise of population.

The standard of living improves with economic development. Consequently, education spreads widely. This leads to reduction of birth rate. Good nutrition and adequate medical facilities reduce the death rate. This situation controls the rise in population. But this has not happened in India. Here population has exploded to an enormous extent. It has been estimated that every 1 1/2 seconds a baby is born in India. Every year about 23 crore babies are born. Out of this number about 14 crore die. About 45 percentage of the population in India is below 14 years of age. It has been cal-

culated that one seventh of the world population resides in India, *i.e.*, every seventh person is an Indian. Only 2.5 per cent of the world land is under the control of India, but on this land 14 per cent of the world population resides.

The Government of India has estimated that every year the population in the country increases by one crore and 32 lakh. With this rate of increase in population every year 1 lakh 25 thousand schools, 4 lakh teachers, 26 lakh houses, 2 crore metres of cloth, one crore 50 lakh quintals of food materials and 45 lakh employment opportunities will have to be made available. This situation is alarmingly deplorable. For controlling this situation the need of family planning and population education has been very rightly emphasized.

Meaning of Population Education

About 45 per cent of the population of the developing countries is within 14 years of age. This age-group is generally at the threshold of adolescence. It is these persons who will in near future begin to play the role of parents. It is this group which will decide the size of the family. So the person within this age group should be educated about the implications of big or small size of their family and its direct bearing on their prosperity and also the prosperity of the nation. So this age group should be well informed on the implied points of family planning. They should be plainly told that the size of the family may be well controlled if there is a definite, healthy and intelligent planning for the same with the help of the medical facilities and other requirements available for the purpose. Thus in the population education we have to inform the youth about the trend of the population in the country and its impact on the growth and economic prosperity of the individual and the nation.

Aims of Population Education

The following may be regarded as some of the more important aims of population education :

1. To tell the young people that the size of the family may be well controlled with the medical aids and relevant advices available for the purpose.

2. To impress upon the youth that a small family is very basic to one's happiness and prosperity.

3. To acquaint the young students about the trend of population rise in the country and in the world, and the implications of the same on human happiness.

4. To explain to the youth how a small family is necessary for family welfare.

5. To impress on the students the alarming implications of dirty and densely populated localities, food problem, malnutrition and poor individual income.

6. To acquaint the youth how economic, social, cultural and political life of a country is closely related with the rise and size of population.

Need For Population Education

We are mentioning below some of the major points regarding the need for population education.

1. About 45 per cent of the Indian population is below 15 years of age. For controlling the alarming rise of population it is necessary to influence this age-group regarding the bad consequences of a big population. So in schools and colleges students should be given population education.

2. In most of the developing countries, there is a definitely planned policy of educating people regarding implications of rise of population. For this newspapers, magazines, radio, television, advertisements and posters are used. The readers and on lookers cannot be kept away from impacts of these phenomena. So our young students will definitely come to know about family planning and its implications directly or indirectly. If there is no definite programme for educating them in a healthy manner about population education; they are likely to be misinformed by many undesirable sources. So it will be in individual as well as national interest to run a well-chalked-out programme of population education for youths.

3. The state is responsible for the welfare and health of its citizens. This responsibility can be well executed only when the people are told about the bad impacts of the population rise.

4. The need of population education in schools were not

there, had there not been alarming explosion of population. But the reality is this that there is an urgent need for explaining the points involved in family planning and population education.

5. He is necessary to explain to the students the evil influence on the cultural, social and economic development due to explosion of population.

6. Problem of population is perennial. Hence young people of each generation must be informed about the implication of the same.

7. Through population education the younger generation may be well prepared in advance to fight out successfully realities and complexities of contemporary life which is beset with the evil influences of population explosion. As a result, they can well co-operate with the nation building programme. Hence the need of population education.

8. In any scheme of population education the youth of the rural area must never be ignored, simply because our population is mostly rural. Hence there is a greater need of spread of population education in the school situated in rural areas.

SUMMARY

Population Explosion in India and in other developing countries. With poverty, population increase, when the standard of living rises, the death rate decreases. Hence the rise in population continuous, though the rate may be a little lower.

Meaning of Population Education.

The younger generation must be acquainted with the various implications of population explosion.

Aims of Population Education :

1. To tell the youth that the size of the family may be controlled.
2. To explain the importance of a small family.
3. To explain the implications of population explosion.
4. To explain how economic, social, cultural and political life is closely related with the size of population.

Need of Population Education :

1. To advise the youth about the bad impact of a big population.

2. Planned method of giving information to the youth necessary, otherwise they may pick up misinformation from undesirable sources.

3. The rural schools must never be ignored.

EXERCISES

1. Discuss the meaning, aims and need of population education.

2. What is population explosion ? How and why should it be controlled ?

Chapter Twentysix

Health Problems of India

Poverty, Ignorance And Huge Population Causes of Bad Health

Poverty is one of the main causes of bad health of the Indian people. No doubt, we have ample resources, but the same have not yet been fully explored and exploited, with the result that we have remained poverty-stricken since centuries. Per individual income in our country is very low. At the same time, some people are so rich that they do not know how to spend their money ; on the other hand, there are innumerable ones who cannot manage their two square meals a day. Evidently, the distribution of wealth in our country is very uneven.

Balanced diet for most of the people in our country is a dream. Lack of education is also another reason of bad health of the people, because they are ignorant of the laws and principles of good health. Lack of cleanliness is another reason of our bad health, because unhygienic condition breeds germs of various types of diseases. There is an urgent need of education in hygiene and health principles in our country for educating the general people in this area. Huge population in the country is another reason of the bad health of the people. Every year there is a great increase in the size of population. This result into lowering of standard of living, because production is not increased at the same rate.

Some Efforts For Improving Health

After independence our government has been trying to improve the health of the people. Before 1947 the average age of an Indian had been 27 years. But due to government and our own efforts now

the average age of an Indian has been raised to fifty years. The standard of living has also improved.

It may be noted that improving of public health is mainly the responsibility of the state government. But the Central government is equally interested in the matter. Hence there is a Ministry of Health and Family Welfare under a Minister of the cabinet rank in the Central government. This ministry gives grants to state governments for improving the health of the people. Under its health programmes may be included prevention and eradication of seasonal epidemics, establishment of a primary health centre in each community block for providing preliminary medical aids to the neighbouring people. The Central government helps the state government in running district and sub-divisional hospitals by providing medicines, appliances and residential facilities to the hospital staff. It also helps in building up new hospitals in various parts of the country.

Nutrition Programme.

Most of our people either suffer from malnutrition or under-nutrition. Children are expectant and nursing mothers are generally victims to this. For improving their health the Ministry of Health and Family Welfare and the Education and Social Welfare Ministry have started certain nutrition programmes in many states. The following are some of the main aspects of this programme :

1. To provide food to children of some primary schools.
2. To give some nutrition to children of some Kindergarten schools.
3. To distribute some necessary medicines to expectant mothers and young children.
4. To provide Vitamin A pills to some children for preventing blindness.
5. To distribute milk without butter and double bread combined with Vitamin A to children in the tribal areas.
6. To give food to children of pre-school age in densely populated dirty localities.
7. To encourage the people to produce nutritious food commodities and to consume the same in a healthy manner. For spreading information about nutrition, so far about 20 films have been

produced in various regional languages. Demonstrations and exhibitions are also organised for making people conscious about the rudiments of balanced nutrition. The Central government is encouraging research in the area of nutrition.

Programmes For Prevention of Diseases

Several programmes at the national level have been organised for prevention of many diseases. We are hinting at some of them below :

1. B. C. G. Vaccination Programme.

In 1949 the B.C.G. vaccination programme was started for cure of T. B. patients and for prevention of this disease in others. By 1973 about 26 crores persons were clinically examined for detection of T. B. and above 17 crore were vaccinated against T. B. Ninety lakh T. B. patients were detected and 280 hospitals in the country were made for T. B. patients. The National T. B. Institute, Bangalore runs a reorientation course for medical practitioners. The Ballabh Bhai Chest Institute, Delhi runs a T. B. and Chest Institute, Delhi runs a T. B. and Chest disease post graduate diploma course. There are more than 200 T. B. centres for looking after T. B. patients in the country.

2. National Filaria Control Programme.

The Central government runs this programme since 1955. Under this programme under-ground drainages are constructed in cities and town affected by filaria in order that mosquitoes and larvas may not breed in the open. Opening of filaria hospitals and destroying mosquitoes and larvas responsible for filaria are the other main aspects of this national programme. A survey has revealed that about 14 crore persons reside in areas prone to filaria. About 90 lakh of these are those who have definite symptoms of filaria. Several units have been established in urban areas for destroying larvas. These units cover about 2 1/2 crore persons.

3. National Malaria Control Programme.

This programme was started in 1953. In 1958 this programme was changed into National Malaria Eradication Programme. It is estimated that by 1982-83 this programme will be completed. The whole country has been included in this programme, except the sea coast areas above the 5000 feet level because malaria has no influ-

ence as such a high level. The Central government started this programme, but the state governments have also been give responsibility for carrying out this programme. The World Health Organization also gives financial aid for this programme. About 40,000 units are active to-day for eradication of malaria. Each unit covers about 15 lakh persons. This programme has been very successful till 1970-71 when the percentage of patients fell to 0.15 from 10.0 in 1955-56. But since 1979 it is reported that the percentage is going again up, because the mosquitoes are getting immune to disinfectants. The area organisations in Lucknow, Shillong, Hyderabad, Baroda, Bhubaneswar and Delhi train workers for this programme. At the state level under the State Health Department there are a number of officers and workers appointed for eradication of malaria, such as Director of Health services, Dy.--Director of Malariology, District Medical Officer of Health, Malaria Officer Incharge of a unit and a number of executives and administrative officers, machanics, accountants, store-keepers, clerks and a host of malaria inspectors.

4. National Trachoma Control Programme.

Since 1963 this programme is in operation. This programme is run in U. P., Bihar, Rajasthan, Assam, Haryana, Jammu and Kashmir, Gujrat, H. P., Meghalaya, Manipur, Karnatak, Keral, M. P. and Punjab under the guidance of the Central government. By 1980 about 14 crore persons were covered under this programme which mainly pertains to health education.

5. National Small-pox Eradication Programme.

Under this programme certain selected persons are again vaccinated for prevention of small-pox. This work was started in 1962. In the beginning about 21 crore vaccinations were done and 22 crore persons were revaccinated. This disease has been partially controlled. In 1972 there were about 28,000 small-pox patients and 5,500 out of these died and in 1980 there were about one lakh small-pox patients and about 27,000 died out of them.

SUMMARY

Poverty, ignorance and huge population causes of bad health.

Some efforts for improving health of the people the Central and State governments are rendering positive services for this. This following programme are noteworthy :

1. Nutrition Programme.
2. Programmes of prevention of diseases—B.C.G. Vaccination, Filaria, Malaria, Trachoma and Small-pox control programme.

EXERCISES

1. Discuss some of the main causes of poor health of people in India.
2. Describe any three programme for control of certain diseases.

Chapter Twentyseven

Health Services in India To-Day

1. The Administrative Structure at the National Level

According to the Indian Constitution 'health' is a state subject. But at the national level as well our Central Government has established a Health and Family Welfare Ministry. This ministry is directly responsible for health problems in the centrally administered areas. The State governments are completely independent regarding public health and medical relief problems. The Central Ministry of Health and Family Welfare advises the state governments on certain problems and gives adequate financial aids for the control of certain diseases, like malaria and small-pox. Besides, it runs many research centres and institutes for finding out suitable measures for controlling certain diseases. The Ministry also works as a co-ordinating agency for various national health programmes and it collects informations from various international organisations in other countries and passes on the same to the Health Ministries of the various states in the country. The Central Health Ministry also prescribes and determines standards for various medicines and certain food materials.

The Central Health and Family Welfare Ministry is under a cabinet minister. There are a number of secretaries and deputy secretaries to assist him. A directorate is also attached to it. The Director General of Health services is the chief of this directorate. A number of deputy-directors and assistant-directors are appointed to help the Director General in the performance of his duties. In 1956, the Government of India established the Central Health Education Bureau. The Directorate of Health services was also divided into

various units such as—1. Medical Care and Hospitals, 2. Public Health and 3. General Administration.

The Public Health Department runs the All India Institute of Hygiene and Public Health. Besides, the Institute of Communicable Diseases and Central Research Institute are also run by this department.

2. Administrative Structure at the State Level

There is a Health Ministry in each state under a cabinet minister. There is usually a deputy-health minister as well, if the nature of the work so requires. There are a number of secretaries, deputy-secretaries, and assistant-secretaries for his help. In many states there are Director of Health Services. He is the chief medical officer and head of medical education. There are a number of deputy and assistant directors under him.

3. The District Level

There is a Chief Medical Officer (CMO) in each district. He is usually the head of the district hospital. Two medical officers have been placed under him. One of these is concerned with the health of the public and the other with medical treatment.

Health Services in the District. Each district has a number of dispensaries, health centres and clinics. The state government is directly responsible for running these services. A number of workers are trained for looking after epidemics, maternity homes and child clinics under the direct care of medical doctors and surgeons officially appointed for the purpose.

Below we shall understand some other aspects of health services programme generally in each state of the country.

Hospital Social Services. The following services are generally given under this category :

- (1) To provide financial aid to medical students.
- (2) To educate the public about the specialized services rendered by the hospitals and clinics running at various places in the state.
- (3) To nurse the patients admitted in hospitals or outside registered for the same.

4. Maternity and Child Welfare Services in India

There have been scattered attempts in this field prior to inde-

pendence. But since 1948 the Government of India took the full responsibility for running these services. Although health has been a state subject, still the Central government gives adequate financial aid to all the states for these services. A number of advisors have been appointed to advise the India Government for this purpose. The Central government sees that the various state governments run their health services satisfactorily. The Government at the centre has the following aims in relation to health services run by various states :

1. To establish ideal health services through out the country.
2. To establish maternity and child welfare bureaus in the country under the supervision of the State government.
3. To improve the training of workers employed for running health services.

The state governments are running the following health services under the guidance of the Central government :

1. Over fifty thousand maternity beds have been arranged in the country.
2. Over five thousand lady health visitors have been appointed in addition to over sixty thousand Dais.
3. Over ten thousand maternity and Child Welfare units have been opened by the various state governments.
4. About twelve thousand Primary Health centres have been started in the country.
5. Training of midwives has been organised and hundreds of them are trained every year.

5. Public Health Nurse

Nursing service is a development of the current century and it is in its infancy in our country. The following are some of the main functions of the public health nurse :

1. To give suggestions to mothers for the right up-keep of their babies.
2. To help the medical doctors in examining patients.
3. To render first-aid, whenever necessary.
4. To encourage the public for utilizing the public health services available in the locality.

5. To educate the public regarding protection from epidemics.
6. To help families when there are some patients there.
7. To inspect how the patients are being looked after by their relatives and family members.
8. To look after patients.
9. To help people to obtain medical assistance for their patients.

6. Community Development Projects

Community Development Projects are primarily to encourage agricultural productions. But sanitation, public health, women and children welfare and cottage industries have also been their jurisdiction in certain respects under each community project. In the state there are a number of Community Development Blocks. Each block is put under a block development officer (B.D.O.). In each state there is a State Development Commissioner, a Deputy Development Commissioner and a number of District Development Officers and District Development Committees. Under the B.D.O. a number of services are run. One of these services is health. In each Development Block there are primary and secondary health centres. The following are the services rendered under these two heads :

Primary Health Centre. Each development block has this primary centre which consists of a dispensary and a medical ward of six beds. The Maternity and Child Welfare Centre is related with this primary centre. For each primary health centre there are two doctor, two compounders, two sanitary inspectors, four vaccinators, two health visitors, four midwives, six trained Dais, one sweeper and a cook.

Secondary Health Centres. Under each block there is a secondary health centre which runs a hospital of 40 beds. For this centre there are an Administrative Medical Officer, an Assistant Public Health Engineer, Malaria Inspector, Senior Health Visitor, a male Medical Officer, a lady doctor, a laboratory technician, a clerk, a stenotypist, a pharmacist, some cooks, at least one nurse, anti-malaria staff and a sweeper.

7. Colombo Plan

About twenty countries organised a conference at Colombo and founded a Colombo Plan Fund for encouraging health services

in each participating country. Under this plan our country obtained 12 lakh pounds as an aid for health services. As a result The All India Institute of Medical Sciences, was established at New Delhi. Our government obtained aid from Canada for treatment of malaria and tuberculosis and other allied medical services.

8. United Nation International Children Emergency Fund

The short form of the unit of U. N. O., is UNICEF. The unit does not get any aid from U. N. O., but the member-nations have organised a separate fund for it. Our government contributes about sixty lakh rupees every year to this fund and it has also obtained crores of rupees as aid for running its primary health centres. UNICEF gives aid to 3,500 primary health centres, 8,000 secondary health centres, 180 hospitals and 150 laboratory equipments. It is with the help of UNICEF that one B. C. G. programme was run, and a pencil factory at Pimpri, D. D. T. factory at Delhi and other health projects have been started.

9. World Health Organisation

India is a member of this organisation since its inception in 1948. Its main office is at Geneva. Its main purpose is to protect and promote health. This organisation tries to obtain informations regarding health and medical treatment problems and disseminates the same to the member-nations which are over 131 to-day. The member-nations contribute to the maintenance of this organisation and in turn obtains financial aids for their own health services. India contributed to it over twelve lakh dollars in 1980 and obtained from it over 15 lakh as a help. This organisation has given financial assistance to over 220 health programmes. Who has sent visiting Professors to more than twenty Medical Colleges in our country. The foundation day of this organisation is celebrated as the World Health Day through out the whole world. For administrative purposes this organisation has six divisions—each for countries within the following groups :

1. Africa—main office at Brazaville.
2. SouthEast Asia Countries—head office at Delhi.
3. Europe—main office at Copenhagen.
4. America—head office at Washington.
5. Western Pacific Countries—head office at Manila.
6. Eastern Meditarianeian Muslim Countries—head office at Alexandria.

10. Medical and Health Education

Medical Education.

There are over 110 medical colleges in our country to-day. Besides, there are about 20 Dental Colleges as well. There is a provision for training of nurses at Bombay, Bangalore, Ahmedabad, Hyderabad, Chandigarh, Indore, Poona, New Delhi, Madras, Vellore and Trivendram. Many big hospitals also are running courses for training of nurses. Some institutions like Ram Krishna Mission, Red Cross Society, and Andhra Mahila Sabha are running nurse training centres. The Central government gives aid to these institutions. There are about 600 nursing colleges and health schools for training of midwives and health inspectors.

To-day greater emphasis is laid in our country on Post-graduate medical education and Research. A number of centres are doing this work in our country. The central governments give grants to these centres.

A Central Health Bureau was founded in 1956 with a view to encourage health education in the country. This bureau has seven technical departments. The main purpose of this bureau is to make the curriculum of health education popular in children, teacher-trainees and teachers working in schools. This bureau gives technical help for health education in various states and centrally administered territories. So far, about twenty such bureaus have been started in various states and centrally administered territories. They have been opened in about forty districts as well.

Indian System of Medicine and Its Education.

Our government has encouraged the Ayurvedic and Unani system of medical treatment as well and at many places integrated courses have not been a success. So the graduates of these courses suffer from an inferiority complex before the allopathic doctors. However, to-day there are over 15 under-graduate colleges giving medical education according to the Indian system. Some voluntary organizations also are giving this education. The Central government tries to see that a minimum standard of education is maintained in these colleges. Provision for post-graduate education has also been made in these colleges.

About eighty colleges all over the country are giving medical education according to the homeopathic system. Out of these, six are government institutions.

There are separate central boards for Aryurvedic, Unani and Homcopathic system of medicines. The members of each of these boards are usually nominated by the government. The purpose of these boards is to prescribe a minimum standard for medical education for these respective systems.

Health Education. Under this are included all those educative informations that are helpful in maintaining the health of the individual, community and the race. Evidently, its scope is very wide. However, primarily, it starts with the health of children who form the units of the society in general. Pertaining to child's health investigations are made for finding out causes of diseases and methods of their cure. In short the aims of health education may be stated as below :

1. To teach children health laws and to guide them for observing the same.
2. To acquaint children with causes and cure of their diseases.
3. To help the teachers and other workers in the school the methods of improving health.
4. To guide the guardians and parents as to how they can maintain their own health and that of their children.
5. To help the community in understanding health problems and their solutions.

SUMMARY

1. Administrative Structure at the National Level.

Central Health and Family Welfare Minister, secretaries, Dy-secretaries, Director General of health services.

2. Administrative Structure at the State Level.

A Health Minister, Director of Health Services Deputy and assistant directors.

3. The District Level :

Hospital, Social Services.

4. Maternity and Child Welfare Services in India.

5. Public Health Nurses.

6. Community Development Projects.

Primary and secondary health centres.

7. Colombo Plan.

8. United Nation International Childrens' Emergency Fund.

9. World Health Organization.

10. Medical and Health Education.

EXERCISES

1. Describe the nature of health services in our country at the national and state levels.
2. Write short notes on :
 - (a) Maternity and child welfare services in India.
 - (b) Public Health Nurse.
 - (c) Primary and Secondary Health centres—under the Community Development Projects.
 - (d) World Health Organization.
3. Give a short account of medical and health education in country.

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